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Tools in a Virginia Railroad Shop

Special Planing Tools—Gages Made on a Boiler-Shop Punch—Testing Pneumatic Drills—A Home-made Machine for Grinding Links

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LOCOMOTIVE driving boxes cannot be bored to receive the crown brasses on account of the lips necessary to retain the brasses. They are often machined on a slotter or shaper but these tools can only handle one box at a time, requiring a new set-up

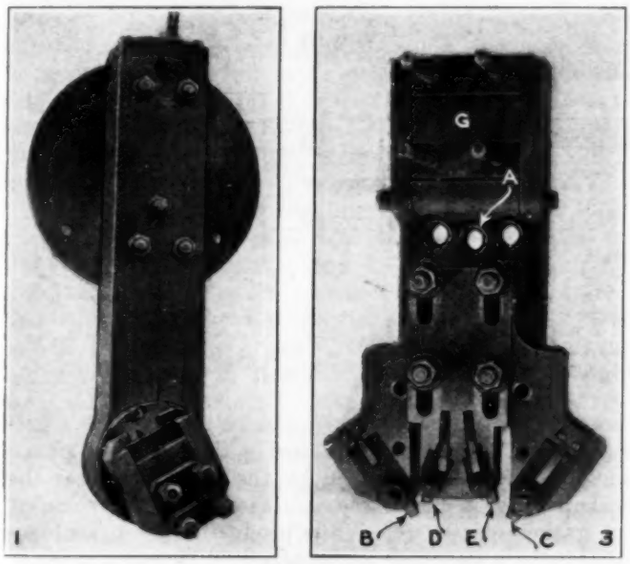


FIG. 1. TOOL FOR PLANING CROWN-BRASS SEATS IN DRIVING BOXES. FIG. 3. TOOL FOR PLANING SHOES AND WEDGES

for each box. The planer, however, is an ideal machine for this operation providing the proper tools are furnished, as the boxes can be set up in a string of as many as the table will hold. A tool for planing driving boxes is shown in Fig. 1. It is attached to the planer saddle by the bolts that hold the swiveling plate, that part having been removed. At the lower end is a worm-driven plate on which is mounted a sliding toolblock fitted with the conventional clapper and box. The toolblock can be revolved by hand by applying a crank to the squared end of the worm shaft at *A* or by power through a miter gear on the worm shaft meshing with a like gear in the saddle and used in the regular down feed. The feed for depth of cut is controlled by a capstan-headed screw on the tool slide. Details of this tool are given in Fig. 2.

Another job to which the planer is admirably adapted is that of machining shoes and wedges. Here, with suitable holding fixtures, they can be strung out in quantities limited only by the length of the planer table. A tool for planing shoes and wedges is shown in Fig. 3. It is attached to the toolslide in place of the apron and clapper box and is arranged to swivel on a stud at *A*. The two tools *B* and *C* take cuts on the outer edges of the work while those at *D* and *E* take their cuts on the inner edges, the feed, of course, being downward. The toolposts are mounted in individual spring-actuated clappers.

It will be noted that the block carrying the tools is a separate piece from the main body of the device to which it is attached by four studs, so that it can be removed for the substitution of other toolholding blocks, and that slots are provided for vertical adjustment. For traversing cuts, the whole arrangement can be revolved 180 deg., presenting to the work a tool held in the clapper *G*.

Machining Crown Brasses

Machining the outsides of crown brasses to fit driving boxes can be done in the lathe, vertical boring mill, slotting machine or shaper, but the vertical boring-mill, owing to the ease in mounting and locating the work and in the adjustment of the tools is, perhaps, the most satisfactory machine for the purpose. A fixture for holding crown brasses for machining in a vertical boring-mill is shown in Fig. 4. Bolts through the slots to be seen in the base hold the fixture to the machine table, while the work is held between the checkered plates above and below.

Clamping is done by the nut shown at the top of the central stud augmented by cup-pointed setscrews in the upper plate. The upper plate is reversible to accommodate brasses of more than one size without interfering with the tool at the start of the cut.

Piston rings are cut from a pot casting that has been bored and turned to the proper diameters. Five rings are cut off at, or almost at, the same time by the multiple tool shown in Fig. 5, in which the tools vary enough in length to part the first ring a little ahead of the second and so on progressively through the lot. The cutting tools are of the circular type, mounted on gear segments and clamped in adjustment by the nut *A*. The tools are not removed from the holder for grinding but are all ground as a unit. Adjustment for height of points is made by revolving the toothed segments by means of a wide faced pinion operated by a socket wrench through the hole *B*. After adjustment the wedge *C*, bearing on the pinion shaft, is drawn tight by a nut underneath, holding both pinion and segments from movement.

Tire-turning tools are forged to shape in dies and mounted in holders such as shown in Fig. 6. The upper edges of the tools are forced up around the contour in forging so they may readily be sharpened by grinding on the top. The holder has recesses in the top and bottom so that both the tools shown in the illustration

can be mounted in the one holder and either one brought into service by turning the holder over.

A set of tools for cutting small gaskets, or washers from sheet packing is shown in Figs. 7 and 8. The blanking and piercing dies are in the base of the tool at *A*, Fig. 7, and the blanking and piercing punches are shown at *B* and *C* respectively. The sheet packing is entered in the slot *D* and after blanking the gasket,

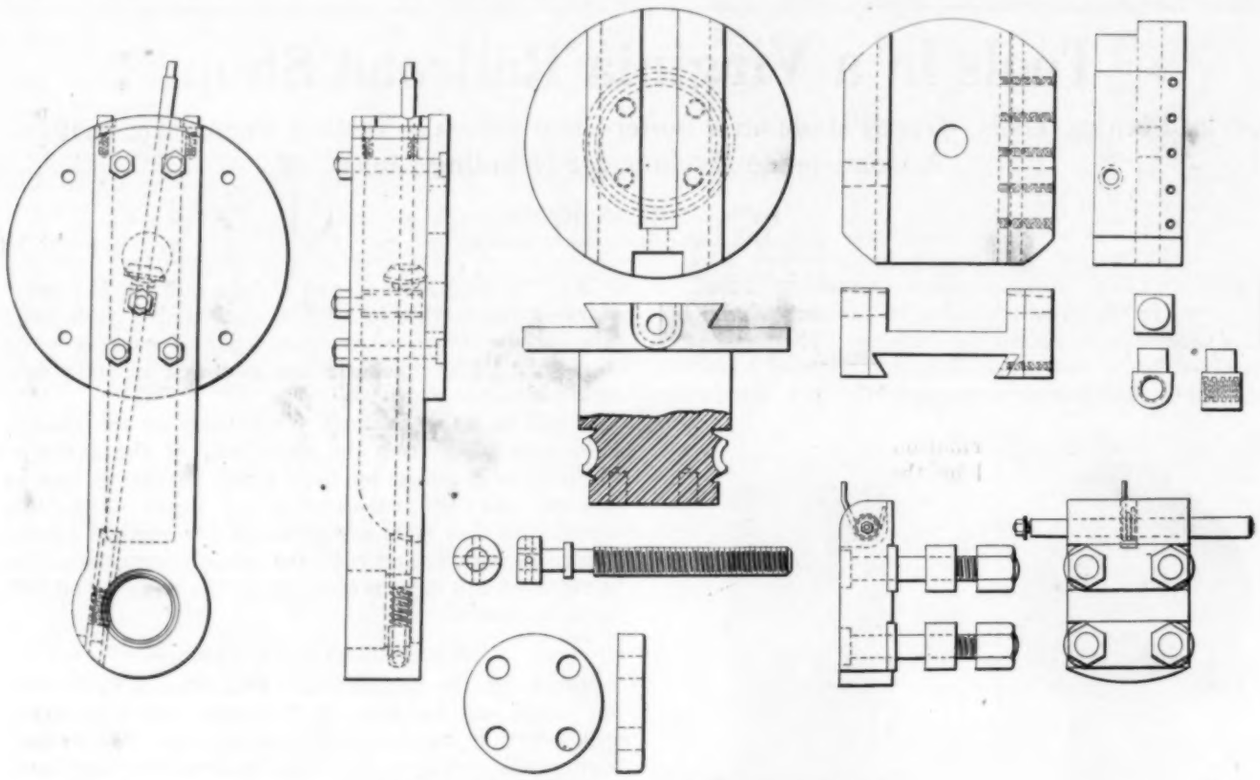


FIG. 2. DETAILS OF TOOL SHOWN IN FIG. 1

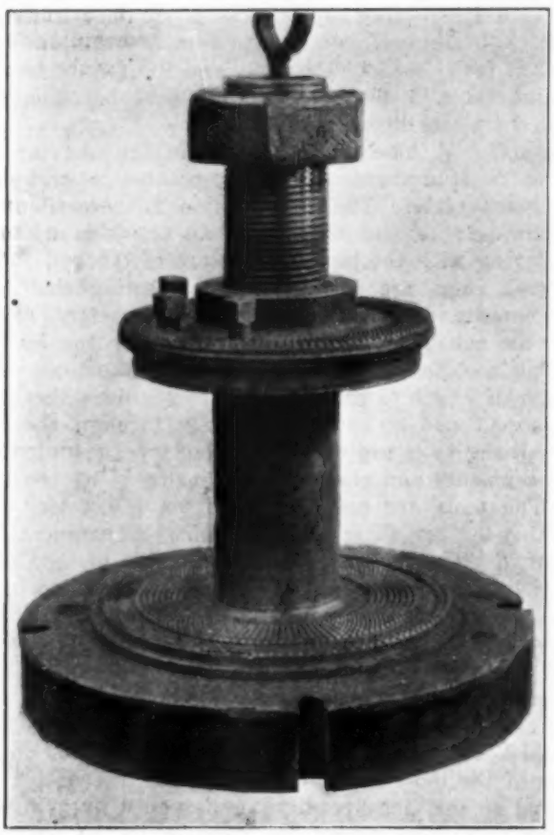


FIG. 4. FIXTURE FOR HOLDING CROWN BRASSES

the punch *B* carries it down and holds it on the piercing die. The punch *C* fits inside the blanking punch and, on being forced down by the handle, pierces the gasket. Fig. 8 shows the tool assembled and some of the gaskets cut by it. While production by a combination die in a punching machine would be much greater, the limited demand for the gaskets can be supplied by this simple and inexpensive tool and one of the tool-

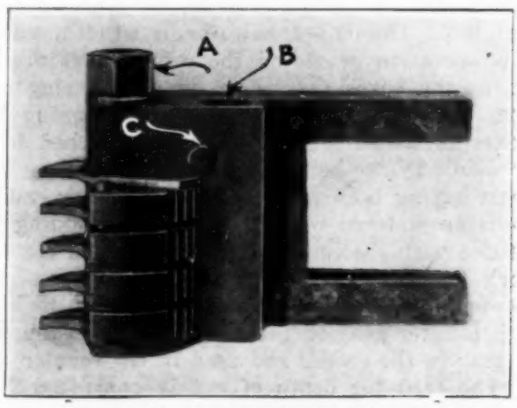


FIG. 5. MULTIPLE TOOL FOR CUTTING OFF PISTON RINGS

crib attendants can cut all that are needed in his spare time.

Master Car Builders' gages for wheel defect, worn journal collars and journal fillets are supplied to a large number of employees and, with the exception of those used by shop foremen do not need to be extremely

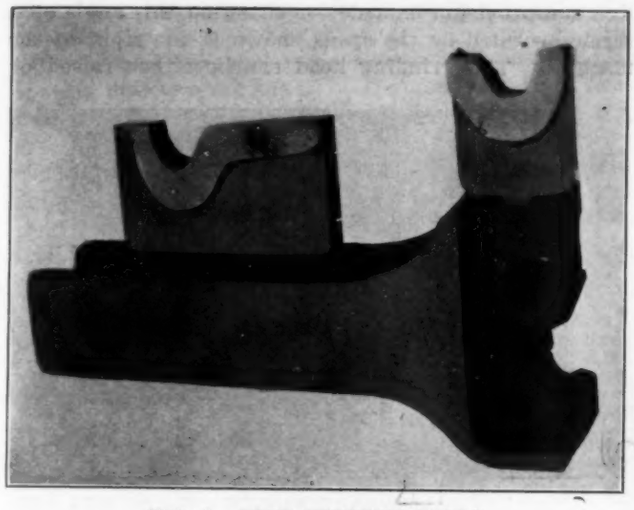


FIG. 6. TIRE TURNING TOOLS

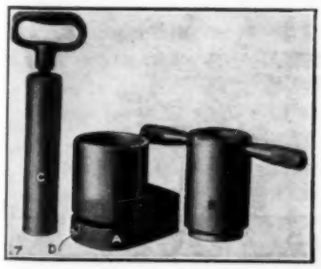
accurate. Gages for distribution to outside men are punched out of sheet steel by the tools shown in Fig. 9, at a cost of a few cents each and answer all the purposes of hardened and ground gages costing several dollars each. One of the gages punched is shown at *A*.

The die is set in a block having a box guide in which the punch holder fits. The reason for this construction is that the tools are used in one of the boiler shop presses in which the ram is not guided with sufficient accuracy for work of this kind.

Portable air drills are tested for efficiency at stated times in the apparatus illustrated in Fig. 10. The spindle of the drill *A* rests on the plunger of an oil cylinder connected to gage *B*. Pressure similar to that of drilling is applied by the screw *C* operated by hand wheel *D*. Air is supplied from the line through the tank *E*. The efficiency of the drill is noted by the amount of air consumed as shown by the "tool-o-meter" *G* in connection with the pressure on the air line registered by gage *H* and the drilling pressure shown on gage *B*. Comparing these readings with readings taken from new drills gives a very good indication as to whether or not a drill needs overhauling.

Repaired drills are tested in this apparatus to see if the repairs have been properly made.

In making and repairing seats for pipes taking steam from the dry pipes to the cylinders the general practice is to use spherical reamers. Such tools are expensive both as to first cost and upkeep. The device shown in Fig. 11 will machine spherical seats in all sizes of dry pipes to be found on locomotives. In use, the spool



FIGS. 7 AND 8. TOOLS FOR PUNCHING GASKETS

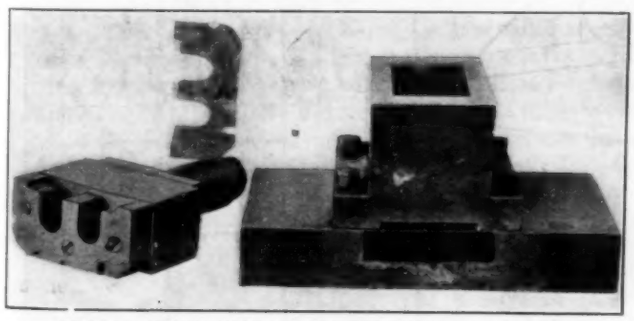


FIG. 9. TOOLS FOR PUNCHING M. C. B. GAGES

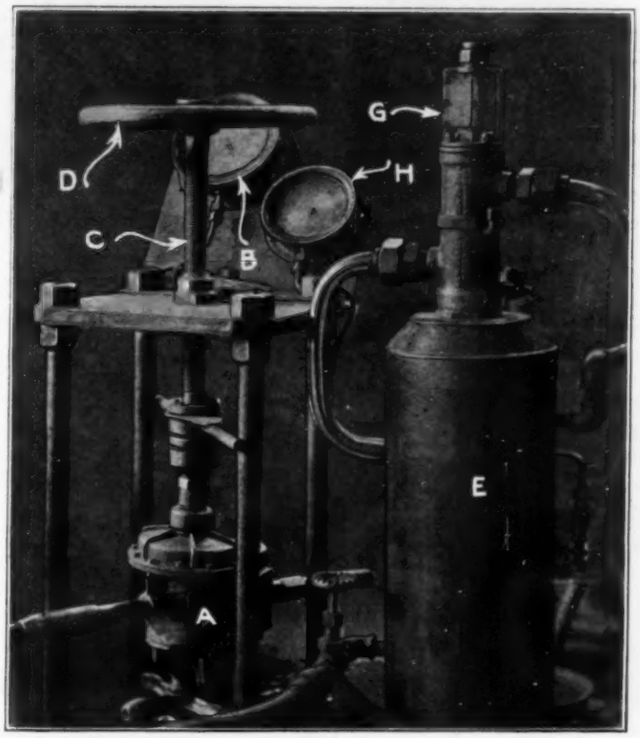


FIG. 10. DEVICE FOR TESTING AIR DRILLS

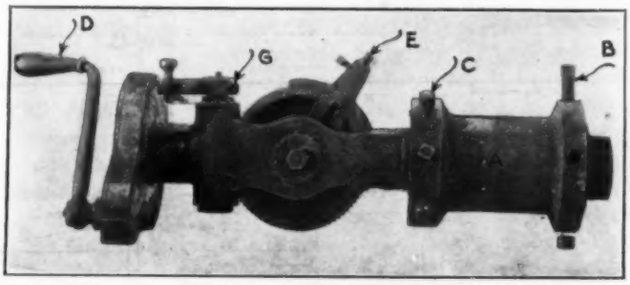


FIG. 11. DEVICE FOR SPHERICAL SEATING

A is inserted in the dry pipe where it is centered by the screws *B* and securely held by screwing out the screws *C*.

The device is rotated on its axis by means of the crank *D*, the inner part of the spool acting as a bearing. As the tool *E* is swept around the seat, it is given an intermittent circular motion in a direction at a right-angle to the axis of the device through worm gearing actuated by the ratchet *G*. The ratchet can be operated by hand, or automatically by a stop clamped to any convenient part of the boiler or smoke box, a helical pull-spring returning the pawls to the starting position after each movement. Seats of any radius within the range of the device can be made by adjusting the position of the tool in relation to its center of rotation. As arranged, the device is intended to be operated by hand, though there is no reason why it cannot be easily arranged for operation by a motor.

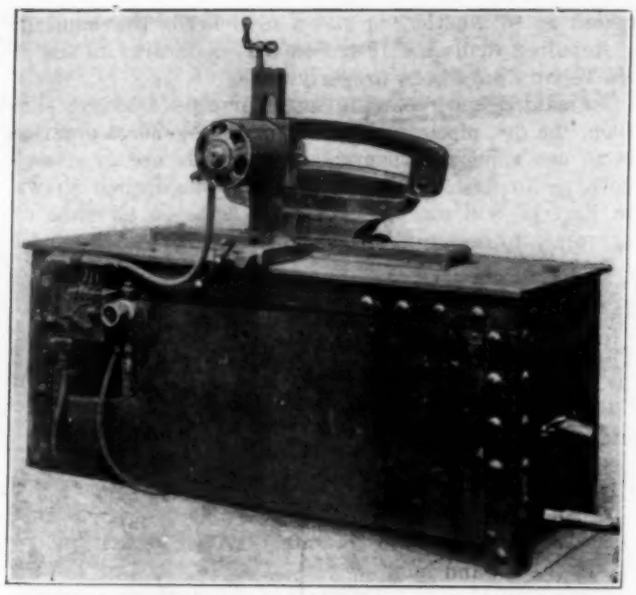


FIG. 12. HOME-MADE LINK GRINDING MACHINE

A very compact, home-made machine for grinding valve-motion links is shown in Fig. 12 and in detail in Fig. 13. The link is clamped to the carriage which oscillates on bars set at an angle. The angle to which the bars are set determines the grinding radius of the link and provision is made for changing this angle by a screw operated by the crank shown at the right of the machine. The grinding head can be either raised or lowered by a micrometer screw. The wheel runs at 5,400 r.p.m. and has a traverse across the link of 4 in. As originally constructed the oscillating motion was operated through a reversing screw, the traveling nut being connected to the carriage by a swinging connecting rod and all motions were driven by belt from a single motor. Alterations have since been made so that the carriage is now oscillated by a crank motion from

FIG. 14. CAUTIONARY NOTICE ON MACHINE TOOLS

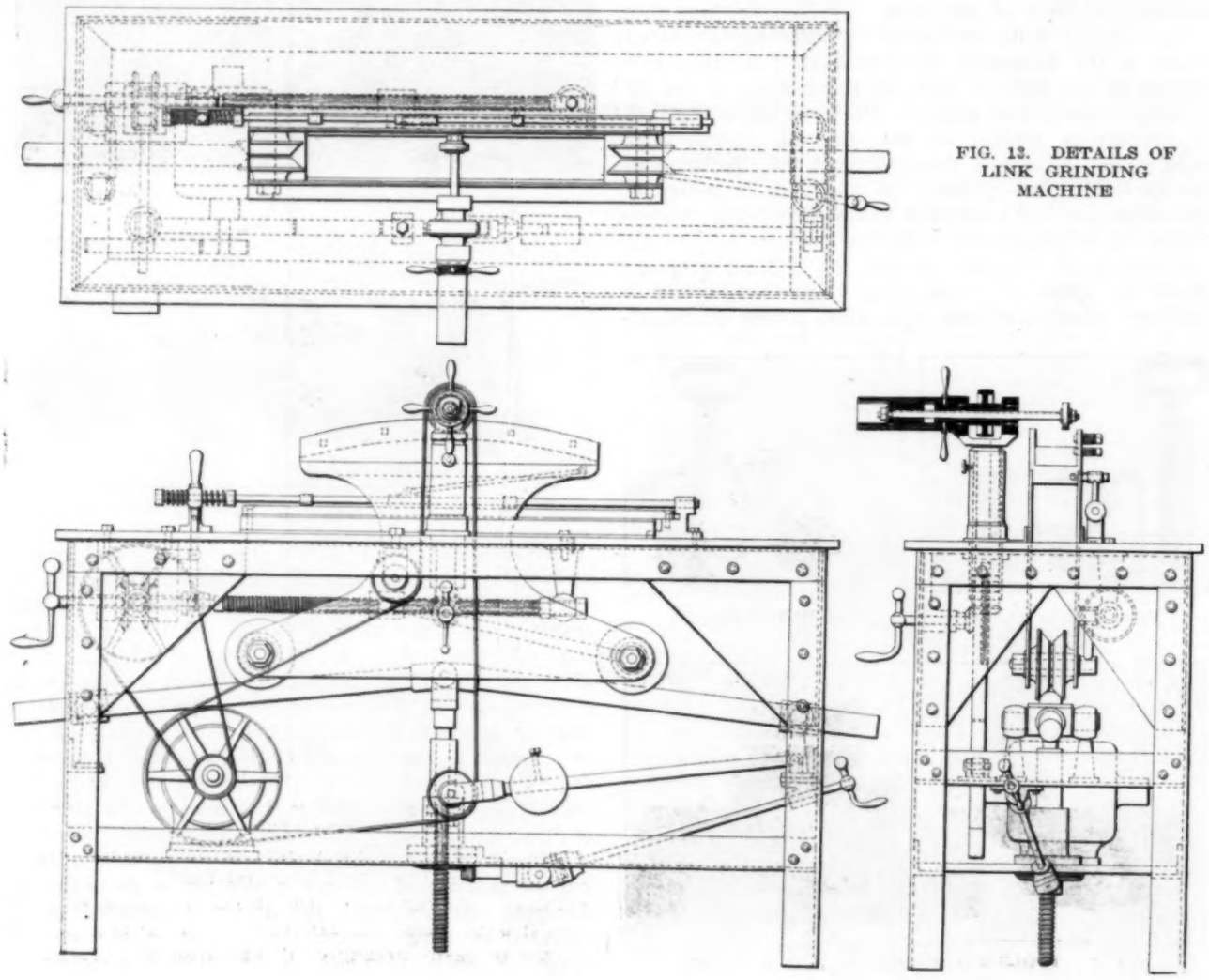


FIG. 13. DETAILS OF LINK GRINDING MACHINE

one motor while the wheel is driven by another motor mounted on the grinding head.

The tools and appliances illustrated and described in this article were made in the shops of the Chesapeake & Ohio Railway, Clifton Forge, Va., where they are in constant use.

That "Safety First" is uppermost in the minds of the management of this shop, is evidenced by the fact that every machine on the premises has stencilled on it in large white letters the cautionary notice shown in Fig. 14.

Super-Standards

By Frank B. and L. M. Gilbreth

The value and importance of standards and of standardization as factors and causes of cost reduction is generally acknowledged by all people today, both inside and outside the industries, who have given both the theory and the practice proper investigation and study.

Dr. Taylor was a firm advocate of standardization as applied not only to tools, appliances and implements, but also to methods, and we desire to acknowledge our appreciation of the great value of the Taylor philosophy and our emphasis on super-standardization due to Dr. Taylor's emphasis on standardization.

Mr. Cooke's definition of a standard as "a carefully thought out method of performing a function, or carefully drawn specification covering an implement or some article of stores or of product" is undoubtedly the best definition to date, but it embodies a thought that is quite different from that which we are emphasizing in considering the subject of super-standardization. The super-standard is the *best known* method of performing a function, etc., attained through the use of the best known units, methods and devices of research. The principle is the same for all standards, but the difference in the degree of refinement of method brings about differences in results that are comparable with the usual results of important inventions.

The super-standard is a logical growth of management as a science. It supplements and does not supersede the standard which remains accepted practice during the transitory or installation period. Standardization has great significance from the management, the economic, the psychological and even the psychiatric standpoint. This is evidenced by the fact that it is universally advocated by management men; that it is endorsed and recommended in the report of the Committee of Waste in Industry; that it is estimated as one of the most important elements of scientific management by present day psychologists and appreciated as a possible solution of certain cases of mal-adjustment by the progressive psychiatrist.

Super-standardization, having all the advantages and none of the limitations of the less accurate standardization, must be conceded to have greater value from all these standpoints. In addition it elminates fatigue, both directly and indirectly, in that it standardizes conditions and methods which induce minimum fatigue and methods which produce efficient habits and utilize the finest, most carefully taught type of automaticity. Concerning itself, as it does, primarily, with elements of motions, it facilitates the transference of skill and thus vitally affects the problem of industrial education.

Outline of address before the Taylor Society, Philadelphia, March 18, 1922.

There is imperative need today for such super-standardization, as evidenced by the need for increased production, elimination of waste and stability.

This country is suffering from unnecessary and wasteful changes, based upon nothing but a desire for novelty and embodying no element of permanence. This does not necessarily mean that there should be no change or less change—it may mean more change. It does mean that changes must be definite, progressive and stabilizing and must pay in money or in durable satisfaction.

On the other hand, Europe has made the most astonishing progress during the last few years. For example, in 1917 the Verein Deutscher Ingenieure, at the suggestion of the German government, organized a central national body, called the "Normenausschuss der Deutschen Industrie." Its members are engineering societies, manufacturing concerns, industrial associations and various departments of the government.

The organization, whose purpose is to foster standardization and to promulgate standards, has attacked many fields and published much material, ranging from standardization of lines and letters in the draughting room, to standardization of window frames for small houses.

Holland has been equally progressive, and the work of the Hoofdcommissie voor de Normalisatie in Nederland is both extensive and intensive. Nothing but a painstaking study of standards issued by these countries can make plain their overwhelming importance. This lies not so much in what they contain, as in what they imply.

Our Hope Lies in Super-standardization

Europe realizes the necessity of standardization as this country does not. Moreover careful investigators confirm our findings that Teutonic Europe will, partly because of temperament, go into this matter more fundamentally than we of the Anglo-Saxon race will be apt to do, if governed only by temperament. An unceasing and costly passion for expediency has already proved a menace to the development of scientific management. Our one hope lies in super-standardization, in reducing all possible practice to standards based on accurate measurement. Here we can be supreme, for we have both the knowledge and the equipment to do the work easily, quickly and inexpensively.

An immediate effort of super-standardization will be the simplification of the problems of maintenance. These have to do with the relation between the engineer and the production manager and the stability of the work begun by the engineer after he leaves the plant and the production manager takes over the entire responsibility. The super-standard adequately applied builds up a super-standardized practice that insures maintenance of that which is best until superseded by proved, better super-standard practice.

An important means toward arousing interest and co-operation in super-standardization consists of definite examples of its application which induce the plant, the industry, or the entire country to think in terms of standards.

In the first cost super-standardization competes successfully with inaccurate methods. In ultimate cost it need fear no possible competition. It is the one best way for obtaining lower production costs and higher wages simultaneously and an immediate way to reduce the cost of living.

Methods of Machine Tool Design

Second Part of the Fourth Section—Belting Applications with Particular Reference to Countershafts, Belt-shifting Apparatus and Tightners

By A. L. DeLEEUW

THERE are cases where it is desirable to use a belt as part of the mechanism of a machine, either because some part must run at a very high speed, or because a geared transmission might cause vibrations. An instance of the first kind is the internal grinder, and one of the second kind is the drive for the work spindle of a cylindrical grinder. Though in this latter case there are machines in existence which have a very satisfactory geared drive, many people prefer the belted drive because it does not require the great care and fine workmanship, and, as a result, is less liable to cause trouble. In cases like the above, endless belts are required because any kind of belt fastener would cause shock when passing over the pulleys. The designer should make some provision for take up and for removal of belt.

There are many ways of joining the two ends of a belt, besides the method of cementing them together, but these various methods have no relation to the design of the machine, so that we do not need to discuss them here. This much should be mentioned, however, that a lumpy joint should never be tolerated.

The endless belt finds a good application in the belted motor drive of which Fig. 38 is a diagrammatic drawing. The motor is fastened to a hinged plate. The hinge is so located that the combined weight of motor and plate produces the desired tension in the belt. An adjustable screw limits the possible movement of the plate. As the illustration shows, the weight causes tension in the belt and pressure against the hinge. The diagram of these forces should be analyzed if one

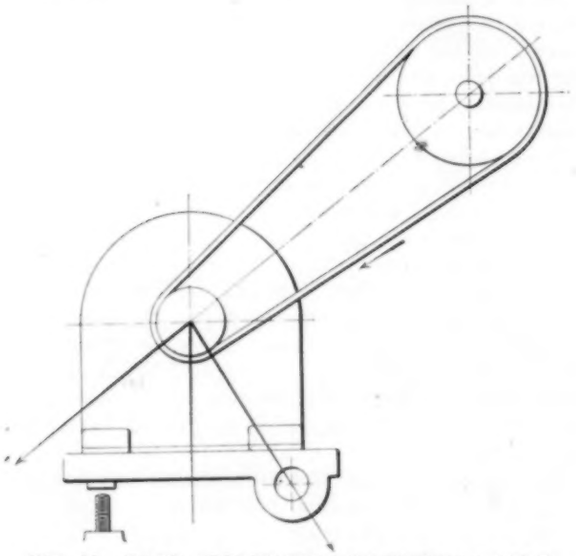


FIG. 38. GOOD APPLICATION OF ENDLESS BELT

wishes to obtain the proper tension. When the belt stretches, the limiting screw is lowered. In this manner a belt may be used during its entire life without any change whatsoever, and with absolute assurance that the proper tension will be maintained.

Idlers are used for four different purposes: To guide the belt in the desired direction; to take up slack; to give the belt the desired amount of tension; and to increase the arc of contact between belt and pulley. In this last capacity the idler has an important bearing on the success of some belt drives. The net tension in the belt—that is, the difference between the tension on the pulley and slack sides—depends, among other things, on the expression $\frac{e^{f\theta}-1}{e^{f\theta}}$ in which e is the base of the natural logarithm system, f is the coefficient of friction, and θ is the arc of contact, expressed in radians. If we compare arcs of 120 and 240 deg. and assume the

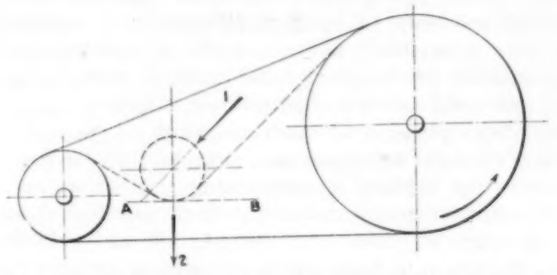


FIG. 39. DIAGRAM TO SHOW SHIFTING OF BELT TIGHTENER

coefficient of friction to be 0.45, we will find the value of $\frac{e^{f\theta}-1}{e^{f\theta}}$ to be

0.6 for 120° and
0.84 for 240°

This indicates the importance of a large arc of contact.

In Fig. 39 is shown the application of the idler pulley for this purpose. It should be located close to that pulley where normally a small arc of contact would be. In order to make the arc as great as possible, the idler should approach the pulling belt as closely as possible. When conditions permit, this idler should also be utilized for the take up. As the distance between the line *AB* and the pulling side of the belt is necessarily small, it might seem that the movement of the idler for the purpose of belt take up must be limited. However, by moving the idler in the direction of arrow No. 1 rather than in the direction of arrow No. 2, it will be found possible to obtain all the take up required.

It is important that the idler press on the slack side of the belt only enough to insure the proper wrapping of the belt around the pulley and the proper initial tension. Additional pressure causes more pressure on the bearings, without compensating features. For that reason weights are used, whenever possible, to insure the correct amount of pressure. Springs are also used, but are not to be recommended, as a spring exerts a variable amount of pressure for various positions of the idler.

Tight and loose pulleys form, perhaps, the most simple means for starting and stopping a machine. Nevertheless, the tendency is toward friction clutches, although these latter have been the source of a good

deal of trouble and are necessarily more complicated and, therefore, more apt to get out of order than tight and loose pulleys. The reason for this preference lies in the fact that it is extremely important to be able to stop the machine with the least possible delay and a single jerk at the shipper lever will accomplish this with a friction clutch; whereas the shifting of a wide belt from one pulley to another takes an appreciable amount of time, however quick the operator may be. The various constructions for tight and loose pulleys

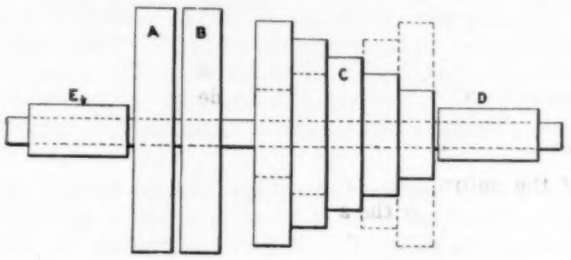


FIG. 40. ELEMENTS OF A SIMPLE COUNTERSHAFT

will not be given here as they may be found in almost any book on machine design.

Countershafts may be arranged for one or more speeds as well as for one or two directions. As a rule very little thought is given to the requirements of a good countershaft, though a great many troubles and delays may be traced to this element of the machine. In late years the countershaft has become of less and less importance, due to the introduction of the single pulley drives which permit of direct drive from the line shaft, from a motor or from a simple jack shaft. Nevertheless, there remains a large percentage of machines still driven from a countershaft, and there will probably be such a class for all time.

Simple Countershafts

A simple countershaft, one speed and one direction only, is shown in Fig. 40. The following points should be considered by the designer, and apart from the design of the various elements which, as has been stated repeatedly, will not be taken up here.

(1) Which shall be the tight pulley, *A* or *B*?

(2) Should the cone be placed as shown in full or dotted lines?

(3) What is the proper diameter and face of the tight pulley, supposing the size of the cone is given?

We can only point out here how to arrive at an answer to the first two questions. A direct answer can be given to the third question: The product of diameter and belt width for the driving pulley should be from 15 to 25 per cent more than the corresponding product for the large step of the cone.

As to the first and second questions, the following points should be considered and balanced against each other and the designer will often have to do something wrong, because doing it right might compel him to commit a greater sin elsewhere.

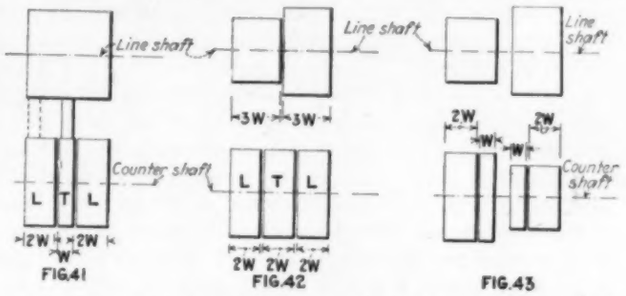
(1) The shaft should be as short as possible to avoid excessive deflection, due to weight of parts and belt pull.

(2) For the same reason the diameter of the shaft should be as large as practical. In a *large percentage of cases*, shafts are made *too small*.

(3) To minimize tension, the tight pulley should be close to the cone (or its equivalent).

(4) To minimize bending, the tight pulley should be as close to the bearing as possible.

Note: Requirements 3 and 4 clash and it is up to



FIGS. 41 TO 43. ARRANGEMENTS OF LINE AND COUNTERSHAFT PULLEYS

the designer to determine in each individual case which requirement is the more important.

(5) To minimize bending, that step of the cone which is called upon to do the heaviest work should be close to the bearing.

(6) The pulleys should be so placed on the countershaft as to bring the shipper lever within easy reach of the operator.

(7) The shipper lever should be so located in relation to the operator that the operation of stopping the machine requires a movement of the hand *toward* the body.

It will be seen that, as a rule, it will not be possible to meet all of the requirements and that a choice must be made.

Arrangements of Pulleys

A countershaft may have more than one set of pulleys, either for the purpose of obtaining more than one speed or for reversal. In many cases a difference of speed is combined with a reversal of direction, as, for instance, in lathes. When there is merely a reversal without change of speed, there is no need for different sizes of pulleys. An arrangement such as shown in Fig. 41 can be used. Here we have *one* tight and *two* loose pulleys, the tight pulley having a width sufficient for the belt used, and the loose pulleys having a face about twice as wide. The dimension *W* in Fig. 41 and subsequent sketches is supposed to be the width of the belt, no allowance being made in the sketch for clearance.

A single shipper lever, with one shifter rod and two sets of shifter fingers can be used. As will be noticed, the operator's movement for stopping the machine is sometimes correct and sometimes wrong.

In Fig. 42 we have the same conditions except that the line shaft pulleys are of different diameter, though the countershaft pulleys are of even size. Here again it is possible to do the shifting with one shipper lever. The total width of the pulleys on the shaft is here 6 *W* plus clearance, whereas in the previous case it was 5 *W* plus clearance.

In Fig. 43 countershaft as well as line shaft pulleys are of different sizes, so that there is no longer any benefit in placing them close together. They can be put anywhere on the countershaft. Here again a single lever will do the shifting. The total room required on the shaft is 6 *W* plus clearance.

In Fig. 44 the idea is dropped of shifting both belts by means of two sets of fingers fastened to one rod, and, as a result, we need only 4 *W* plus clearance on

the shaft. Furthermore, we are no longer compelled to place the loose pulleys on opposite sides of the tight pulley, but can place them as may be most desirable. We can so place them, for instance, that we obtain the correct movement for stopping the machine.

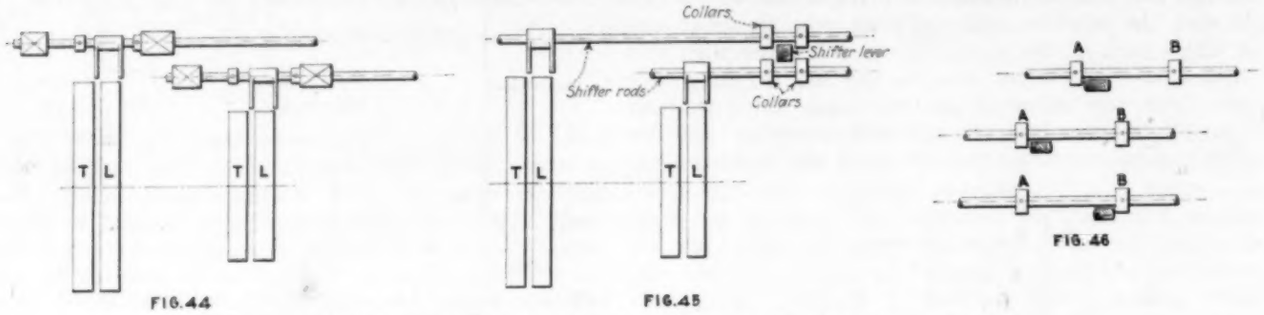


FIG. 44 FIG. 45 FIG. 46

FIGS. 44 TO 46. ARRANGEMENTS OF SHAFTS, PULLEYS AND SHIFTER RODS

It is very important to arrange the stopping and starting device of any machine so that the *operator makes the movements which he would make if he were in personal danger.* A man is liable to lose his head when trouble suddenly appears and drop the habits of a lifetime to follow his animal instincts. Recognizing this in the design of machine may save the machine from being wrecked or some man from being injured or killed.

To do the shifting by means of two shipper levers is not desirable; it leads to confusion and both belts might be thrown on at the same time. To avoid this a construction is used resembling, at least in principle, the gear shift lever of an automobile. There are two shifter rods, each with its own set of belt fingers. Each of these rods has a set of collars between which one may bring the shipper lever, which is hung from a ball or universal joint. Fig. 45 shows this arrangement in diagrammatic form, and Fig. 47 shows the manner in which some of the details are worked out.

Unless a shipper lever is locked it has a tendency to fall back to its normal position (vertical), and this means that the belt will be thrown off or on when this is not wanted. A common way of overcoming this difficulty is illustrated in Fig. 46. It consists of providing the shifter rod, that is the rod which carries the belt shifting fingers, with collars or pins which are to be engaged by the shipper lever. The collars or pins are so placed that one of them is against the shipper when the belt is on, and the other when the belt is off. If A and B are the two collars, and the shipper moves in the direction from B to A, in order to put the belt on the tight pulley, then collar A is against the shipper when the belt is off, thus giving the shipper the chance to work against A without any lost motion. When the belt is on and the shipper is released, it falls back and against collar B, thus making it possible to throw the belt off, again without lost motion.

Some such arrangement is even more necessary when two belts must be manipulated. Not only is there danger that the shipper may fall back, but the operator might easily make the mistake of pushing it forward again and throw the wrong belt on. To avoid this the collars A_1B_1 and A_2B_2 are spaced as in Fig. 47. The shipper E is hung from a ball joint and can engage either of these sets of collars by being moved sideways. A forward movement will then move rod C_1 or C_2 and throw one of the belts on. While on this forward movement the shipper is guided by guide D. When the shipper is released it will fall back and be in position to operate against collar B_1 or B_2. It also falls sideways into its original position and as the collars are positioned as shown in Fig. 46, there is nothing to prevent the operator from making a false move and pushing the other belt onto its tight pulley. To avoid this, collars B_1 and B_2 are provided with projections or hooks,

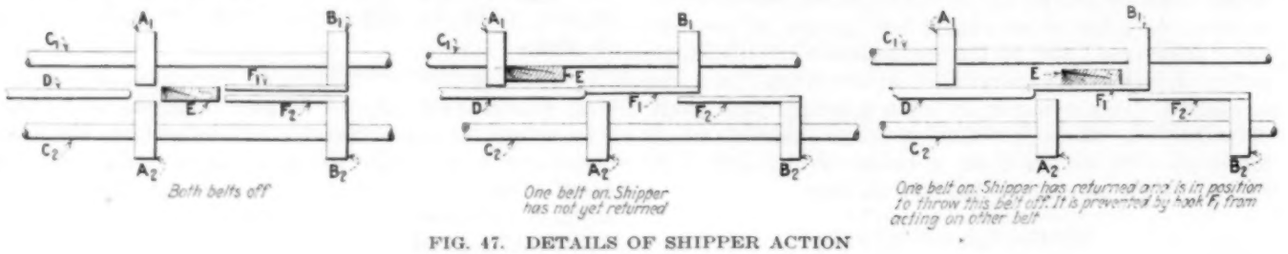


FIG. 47. DETAILS OF SHIPPER ACTION

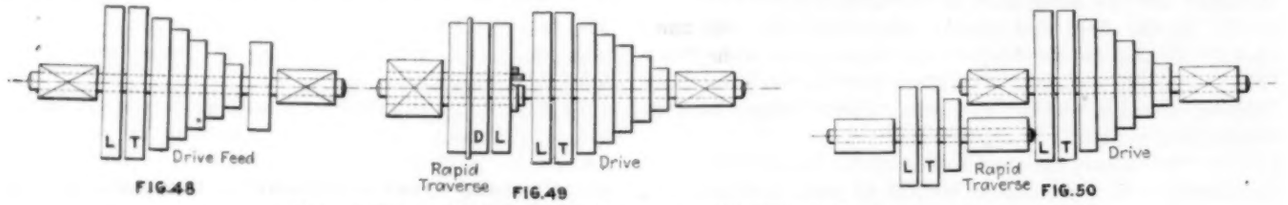


FIG. 48 FIG. 49 FIG. 50

FIGS. 48 TO 50. COUNTERSHAFTS FOR COMBINATION OF DRIVES

so arranged that the hook of B_2 shuts off the pathway of the shipper for B_1 and vice versa. These hooks are in different planes and both are in a plane different

from that of guide D, so that there can be no interference. Similar arrangements might be made for more than two speeds.

It often happens that the countershaft must furnish power for some other function of the machine besides the drive, such as feed or quick traverse or oil pump, or it may be that there is more than one drive to the machine, such as for duplex machines or special machines with a number of independent spindles. Sometimes these various drives bear such a relation to each other that all of them should be started and stopped simultaneously, and sometimes the opposite is required—that is, that one drive should be independent of the other. Fig. 48 shows a countershaft arranged for the drive and the feed of a machine.

Though such an arrangement is not desirable, generally speaking, there are cases where some special machine can be materially simplified by driving the feed from the countershaft. It is very important to stop the feed at the same time as the drive, for if the feed should continue after the drive has stopped tools would be broken or the machine wrecked. Fig. 49, on the other hand, shows a combination to be used when it is desirable to start the two functions of the countershaft separately. In this case the secondary drive is for a quick traverse motion of the machine or for an oil pump or for any other function which we may desire to continue after the drive has been disconnected. It would be possible, of course, to build an entirely independent countershaft, and this is often done. This scheme has certain disadvantages.

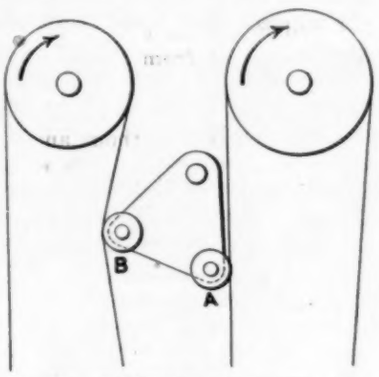


FIG. 51. ROCKING IDLER FRAME

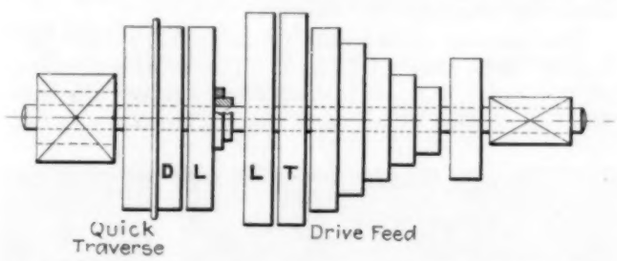


FIG. 52. COUNTERSHAFT WITH THREE DRIVES

In Fig. 50 is shown how it becomes necessary to place the quick traverse drive further away from the main drive so as to allow the belt coming from the line shaft to clear the hanger of the main countershaft, and this, in its turn, means that the machine itself is to occupy more space than necessary. The arrangement of Fig. 49 is this:

A sleeve is attached to the hanger or box of the countershaft and on this sleeve two loose pulleys are mounted. One of these is a single pulley and acts as the loose pulley for this system. The other pulley, also running loose on the sleeve, is divided in two parts by a flange, one part receiving the belt from the line-shaft and the other delivering the driving belt to the machine. Sometimes these pulleys run directly on the countershaft, but this is not advisable on account of the difficulty of properly lubricating the pulleys. The part *D* or the pulley may drive more than one machine pulley, such, for instance, as one for the quick traverse and one for an oil pump.

The chief objection to driving the feed by means of a separate belt from the countershaft is the fear that the driving belt may break or fly off. The arrangement shown in Fig. 51 is sometimes used to overcome this objection at least partially. It consists of two idlers hung in a rocking frame. A weight or spring, not shown in the drawing, forces pulley *A* against the tight side of the main belt. Pulley *B* bears against the slack side of the feed belt. This belt becomes slack and fails to drive the feed if the main belt breaks. As will be seen, this is only a partial remedy, for the feed belt would continue to function if the main belt should slip. Fig. 52 shows a countershaft with main drive, drive for feed and independently operated drive for quick traverse.

It is advisable to keep the countershaft as simple as possible. Should conditions compel the use of a complicated countershaft, this piece of apparatus should be constructed self-contained and with as much care and forethought as any other part of the machine—something which, as a rule, is not done.

Be Fair in Your Criticism

BY F. H. SWEET

Effective supervision demands on the part of the executive a thorough and complete knowledge of methods and results. Too often a subordinate is allowed to proceed without supervision until he has finished his task, or until he has accumulated considerable results. You find these results not to your liking, and you censure him for not having requested supervision, when you yourself are at fault for not having furnished it in the first place. I do not mean to say that you cannot often judge by the results you are getting. In fact, it becomes necessary sometimes to limit supervision to a judgment of results.

It should be emphasized, however, that when you choose to supervise in this way, you yourself take the risk. Your criticism of the result, if adverse, must be made in a spirit of suggestion, to be used solely as a guide for future procedure and not as a criticism that might cause disappointment and discouragement, for you are responsible for the manner in which you elected to apply your supervision.

What Is Management?

BY ROBERT GRIMSHAW

Management has been somewhat inaccurately defined by some bright individual as "earning one's living by the sweat of another's brow." In some sense it is correct, in that the manager, or contractor, or *entrepreneur*, as the term now goes, does at least *get* a living by others'—not one other's—exertions. If he is a good manager, he cannot merely get a living but earn it, by increasing the output and efficiency of the workers confided to his direction, and while decreasing the unit product cost, increase the workers' daily earnings, without unduly fatiguing them.

Steering Knuckles for the Mack Truck

Milling, Drilling and Boring Operations on a Heavy Forged Steering Knuckle—Fixtures Used Are of More Than Usual Interest

BY FRED H. COLVIN
Editor, *American Machinist*

THE steering knuckles of any motor-driven vehicle receive severe punishment and not only must the material be strong and tough, but it must also be carefully machined. The fixtures and operations used in finishing the steering knuckles for the Mack trucks at the Allentown, Pa., plant of the International Motor

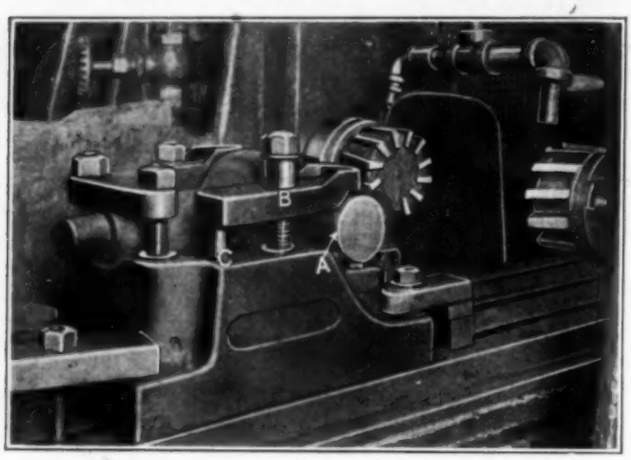


FIG. 1. MILLING THE ENDS

Company, are of more than usual interest, the main operations being illustrated herewith.

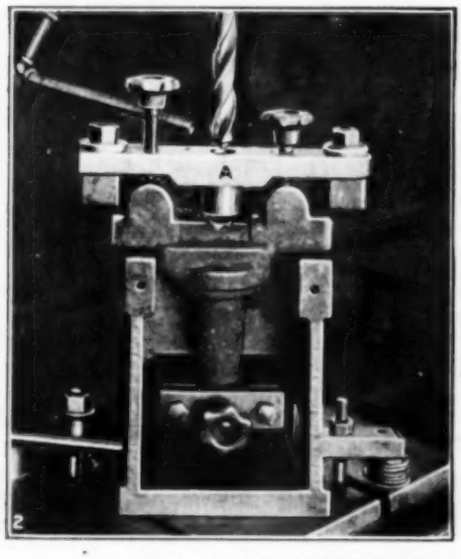
After heat-treating, the ends of the forgings are milled to length and squared for the boring of the spindle hole. This is done in the Cincinnati duplex milling machine, shown in Fig. 1. The fixture is a substantial block fitted with locating pins *A*, while the axle end of the knuckle rests in suitable V's. The clamp *B* is slotted on the under side, this slot guiding it on the upper end of the stud *C*, which serves both as a guide and a support for the outer end of the clamp.

A clearance hole is then drilled in the center of the knuckle, as shown in Fig. 2. This hole gives a clearance space for the rough-drilling which is done from each end, and also gives a starting point for the ball end milling cutter which roughs out the space for the axle. The fixture is comparatively simple, the spindle end of the knuckle rests in a V at each side, while the plate *A*, which carries the guide bushing, swings over the knuckle and holds it in place by the two screws shown.

The ends are then centered and rough-drilled into the clearance hole, a $1\frac{3}{8}$-in. drill being used for this preliminary operation, which is shown at the right of Fig. 3. The next drilling enlarges this hole, the knuckle being held in the fixture shown at the left in Fig. 3. Here the knuckle is again drilled from each end, the fixture being turned by the handle *A*, and indexed by the pins *B*.

The knuckles next go to a knee-type milling machine equipped with a special fixture and a ball cutter, as shown in Fig. 4. Starting with the clearance hole previously drilled, this cutter mills away the central portion, after which the knuckle goes to the horizontal boring machine shown in Fig. 5. Here the central portion is cut away as at *A* by sweep cutters inserted through the bar *B*, after it has been passed through the hole in the knuckle. The holes are also reamed in this operation, the reamer *C* passing clear through both sides and correcting any error in alignment which may have existed up to this point. The opening left by this operation receives the end of the axle and gives it sufficient clearance for turning.

The turning of the stub or axle end is done in the Gisholt lathe shown in Fig. 6. The knuckle is clamped at the ends as at *A*, and steadied against side movement by screws *B* on each side. The axle or stub is



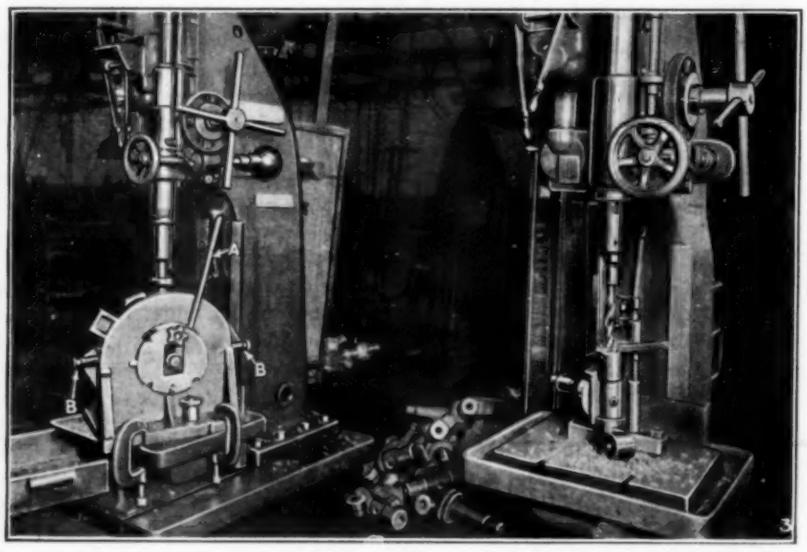


FIG. 2. DRILLING A CENTRAL CLEARANCE HOLE. FIG. 3. TWO OF THE DRILLING OPERATIONS

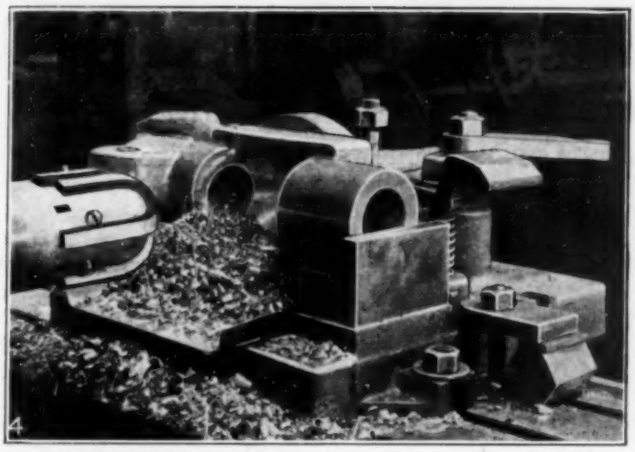


FIG. 4. MILLING THE CENTRAL OPENING.

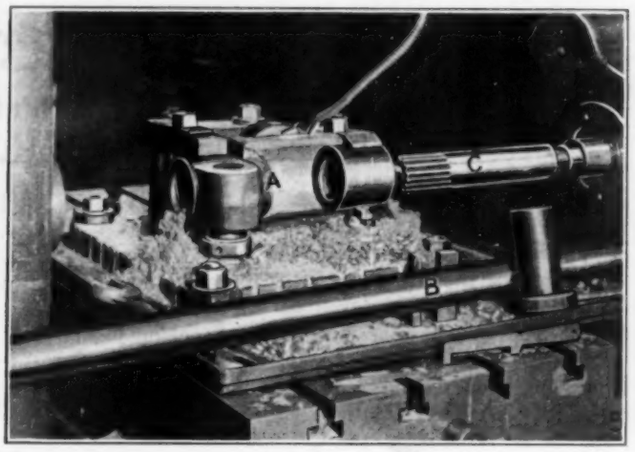


FIG. 5. COUNTERBORING AND LINE REAMING

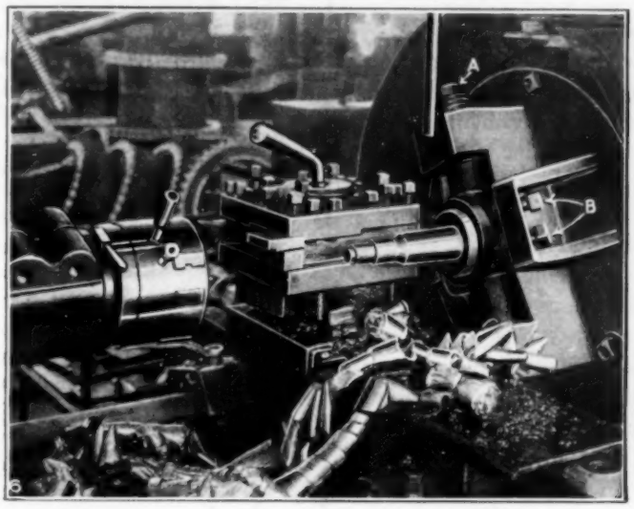


FIG. 6. TURNING THE AXLE END.

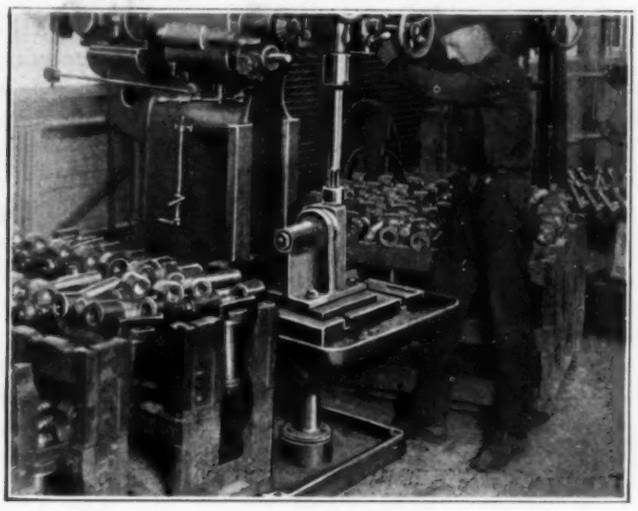


FIG. 7. THE FINAL REAMING

then turned and formed by tools in the square turret, after which the end is threaded with a geometric die head for the retaining nut.

The final reaming is done with the knuckle held in the special fixture shown in Fig. 7 under a Colburn heavy-duty machine. This view also shows the type of carrying tray used for handling the work so as to be easily accessible and at the same time protecting it against damage.

Simple Method of Marking Patterns and Keeping Records

By P. H. White

There are many excellent methods of marking patterns on engineering drawings, and any system that is well established and giving satisfaction should not be cast aside except for very good reasons. Among the different systems that have come under my observation, none is more simple than the one described below.

Each drawing is given a number, according to whatever numbering system is used. If the complete drawing requires more than one sheet, each sheet bears the same drawing number, but a different sheet number. Thus if drawing 476 consisted of four sheets, the designation would be "476, 4 sheets—sheet 1," "476, 4 sheets —sheet 2," etc. The details are all numbered consecutively, and these numbers are shown in the material list as well as under each detail part.

Every detail requiring a pattern is so indicated on the detail drawing by calling for a pattern number. The pattern number is designated by giving both the drawing number and the detail number. For example, if detail number three on drawing 476 required a pattern, the pattern number would be 476-3.

This method eliminates the necessity of keeping a separate book for pattern numbers, and enables any workman to call for the correct drawing, simply by reading the pattern number which appears on the casting. It might truthfully be called "An automatic pattern numbering system."

For keeping a record of patterns when completed, an index card is used, bearing the number of the pattern in the upper left-hand corner, and the name of the pattern just below. Next follows a brief description of the pattern, such as wood, wood master, metal, gated, plate, etc.; and in case of gated or plate patterns, the number of patterns per gate or plate. Another line indicates the number and kind of core boxes. At the bottom of the card is indicated where the pattern was made, the date and cost.

On the reverse side of the card is indicated the date and the place to which the pattern is to be transferred. When the pattern is returned from the foundry, the date of its return, and its location in the pattern vault are designated. These cards are filed consecutively, so that it is an easy matter to locate any pattern and read its complete life history in a very short time.

Factory Storekeeping and Material Control

The Fourth Article—Duties of the Purchasing Department—Speculative and Routine Buying—Distribution of Order Copies—Follow-Up Procedure

By HENRY H. FARQUHAR

IN PREVIOUS discussions I have indicated why I felt that the regulation of material was logically and necessarily the job of the production department. There is no more important function in material work, however, than that performed by the purchasing department, since irregularities here will emasculate an otherwise perfect stores routine. In modern business it is no longer the exceptional and spectacular transaction that makes one plant stand out above another. It is largely the penny saved here and there that makes up the dividends. Such savings may be accomplished only through a well-rounded and balanced organization. Since material routine leads into purchasing at so many points, it is essential to take the view that material control includes all officials who are in any way responsible for or deal with this part of the business. From this viewpoint, therefore, purchasing forms a most important link in this chain. It does not, however, follow that the purchasing agent must in all cases report to production from an administrative standpoint (see Organization Chart of Material Personnel on page 735 of *American Machinist*).

WITH A CLEAR definition of duties controlled through a logical and simple routine, the purchasing agent may devote more attention to the important purchasing features and may become a specialist in his own line.

Speculative buying may be justified by traffic conditions, supply and demand, probable price movement, sales tendencies, labor market, storage considerations or the company's financial state.

The purchase order should leave no doubt in the mind of the vendor, as to exactly what and how much is wanted, when shipment is desired and how it is to be made, and the terms of purchase.

The purchasing office has a chance to affect profits at every turn, and at many times the difference between dividends and bankruptcy may rest upon the transactions of this department. The instance shown in Table I illustrates the directness of this effect, where by a decrease of 6.37 per cent in the cost of the raw materials themselves an increase of 9.7 per cent in the *net profit* was obtained.

It is not with technical purchasing, however, that this article deals. This part of the work of the purchasing office is conducted extremely well in the average plant, for the modern purchasing agent has been trained to the specific duty of securing suitable material at the best price, and various works upon the subject may be found in any library. I feel, however, that the more routine part of his work has not been sufficiently emphasized, particularly as it affects the degree of control which may be exercised over functions other than buying proper.

I have found, moreover, so many purchasing agents who could really be lifted out of the rut into which they had fallen, through standardizing the many little irregularities that distract so much attention from the work which constitutes their main interest. The importance of the many points of contact between the purchasing office and the rest of the organization dealing with materials, and some of the means by which this contact may be made more effective in practice, I trust will be clear from the following discussion.

After the engineering department has made up lists and specifications of materials to be kept on hand, after the traffic and purchasing departments have in conjunctions furnished the time necessary to renew, to which has been added other allowances for clerical work and for necessary delays, and after the balance sheet has been put in operation through a passage for entry of all necessary papers, the replenishment order for originating from the balance sheet, or otherwise, sets the purchasing machinery in operation. It is not strictly the purchasing agent's province to originate requests for material, although it is his duty to notify the production department or the specific man responsible for material control routine, as to any probable changes in the market or other factors which in his judgment make purchase desirable. In the case of speculative purchasing he may originate the replenishment orders. In general, however, his duties start with the receipt of the replenishment order, and on this authority all of his future actions are based. It therefore follows without argument that no oral requests for replenishment must be acted upon by the purchasing agent unless they be immediately followed with a written confirmation on the proper form properly approved. A relaxation in this respect will very soon put the purchasing agent on the defensive if he has not the replenishment order to fall back upon.

TABLE I—EFFECT OF COST OF RAW MATERIALS ON PROFITS

	Original Per Piece	New Per Piece	
Material	$0.63	$0.59	Decrease of 6.37%
Labor	0.10	0.10	
Overhead	0.05	0.05	
Total cost	$0.78	$0.74	
Selling price	1.40	1.40	
Profit	$0.62	$0.66	
% of cost	79.5%	89.2%	Increase of 9.7%

The discussion up to this point, applies equally to speculative and to routine purchasing. Upon the receipt of the replenishment order, however, the procedure varies until the contract is closed. It is there-

For the author's forthcoming book. All rights reserved.

fore necessary to treat this intermediate stage under these two divisions.

Whether or not both kinds of purchasing are done by one man or by different men, the only difference in the procedure between speculative and routine purchasing is that in the former case the amount of any item in the speculative class called for on the replenishment order must be looked upon simply as indicating production's actual needs for the time being and not as a hard and fast amount which must be bought. In other words, the purchasing agent is not governed so strictly by the amount called for on the replenishment order as he is in the case of routine purchasing. Depending on the state of the market and other factors, he may order either more or less, at a given time, than the replenishment order requires.

The replenishment order, however, is production's best judgment as to how much of any material should be ordered. If the purchasing agent wishes to depart from this judgment in any specific case, he may:

(1) Consult the production department or possibly the general manager, or both.

(2) Have blanket authority to increase by a definite amount or by a certain percentage the amount called for on the replenishment order.

(3) Be required to secure written approval for each transaction.

Buying More or Less Than Required Justified by Conditions

In any event, however, it must be made perfectly clear to the purchasing agent that it is not only his privilege but his duty to take up such cases as he thinks desirable, since production is not infallible in these matters. Any one of the following factors may, in the purchasing agent's opinion, justify buying more or less than the quantity called for:

(1) The traffic conditions: A freight embargo which gives the appearance of lasting any considerable period would immediately call for an adjustment upward of the amount to order. Here co-operation with the traffic department is required.

(2) The supply and demand for the particular article to be purchased: The purchasing agent should keep himself informed as to the state of production in each article and as to the probable demand for it throughout the country.

(3) The probable price movement, particularly in articles subject to stock market speculation.

(4) The sales tendencies for the product in which the article is to be used: Is the demand increasing or diminishing, and is production able to keep up with or ahead of any increase? Here co-operation with both sales and production is necessary, but such conditions must not be overlooked by the purchasing agent. Keen insight into the vagaries of the business cycle is necessary to relate purchases to price and sales trends.

(5) The labor market: Is an ample supply of labor available? Here again this is primarily production's concern, and yet the purchasing agent from his contact with traveling salesmen and others is in a position to furnish production with accurate and current information in regard to such conditions.

(6) The storage considerations: Have we sufficient room to store all that we would like, and if not, where and at what cost may adequate accommodation be secured? Will the additional cost of such storage counterbalance any probable saving due to buying in quantities far in excess of known production needs?

(7) The state of the finances of the company: Is money available for buying an excess of material, no matter how desirable, and will the loss of interest on such idle money counteract any price reduction from buying in quantity?

Since most of these matters are largely questions of judgment the only safe procedure is for the purchasing agent to receive the regular replenishment orders emanating from the balance sheets. This will back up production. In order to back himself up, the purchasing agent may secure the written approval of the general manager or some other official when the amount called for on the replenishment order is not followed.

A form for approval to change the amount requisitioned refers to the replenishment order received from the balance clerk and makes the recommendation that a different amount be purchased. Reasons for the change are given. The order is signed by the purchasing agent and space is provided for a notation of the action taken by the general manager or other official and his signature.

In times of hand to mouth buying, the replenishment order will prevent overstocking. On a rising market where long contracts may be placed it may still serve to secure deliveries in accordance with production needs. It may, therefore, serve a useful purpose at all times. As indicated previously, the purchasing agent is expected to initiate action even before the receipt of the replenishment order if, in his judgment, conditions appear to require or render advisable immediate or heavy purchase.

After a decision to purchase is made and approval secured, technical purchasing then comes into play until the terms are made and the contract closed. The procedure from then on is identical under both speculative and routine purchasing.

Routine Purchasing Most Satisfactory in Many Plants

It may be objected that such a division of work and responsibility is limiting the purchasing agent and giving him a smaller place within the organization than that to which he is rightfully entitled. This, indeed, is almost the invariable reaction when such a reorganization is proposed to an existing purchasing agent. That the reverse is actually true, however, in that the purchasing agent is given a much better opportunity to measure up to his responsibilities, would seem to be proved by the number of plants and purchasing agents which have found such an arrangement entirely satisfactory.

By such a clear definition of duties according to functional lines and abilities, assisted and controlled through a logical and simple routine, many purchasing agents have found that they could give more attention to those features of the work for which they have long desired more time. They can stand absolutely within their own ground as defined and yet have an ample chance to influence others with whom their work is connected. It is simply a further logical extension of the modern subdivision in administrative duties whereby each man may become a real specialist in his own particular line, unhampered by irrelevant or distasteful routine, or wrongly placed responsibility.

After the decision to purchase is reached, therefore,

the formal purchase order is issued. This must provide for:

(1) The serial number of the purchase order. This gives a cross index between the replenishment order and the purchase order, since when the latter is made out its number must be entered on the replenishment order and the replenishment order number entered on the purchase order. In case one replenishment order calls for several articles requiring several corresponding purchase orders, care must be taken to see that these cross reference entries be completed.
(2) The name of the company making the purchase.
(3) The date of the order.
(4) The name of the vendor from whom the purchase is to be made.
(5) The quantity and description of the goods ordered. This should be specific, so that if there is any mistake in the goods the vendor cannot lay it to a lack of definite detail.
(6) The date the delivery is wanted. This again is just as important on the purchase order for the information of the vendor as it is on the replenishment order for the guidance of the purchasing agent.
(7) The shipping and billing directions. Much trouble is caused in every receiving department because incoming packages are improperly marked. The necessity for marking all packages on the outside with the purchase order number should be emphasized in a prominent place on the face of the purchase order.
(8) The symbol or other short designation of the article ordered. This is for definiteness and to save clerical work in writing and re-writing long names.
(9) The name of the requisitioner.
(10) The department or person for whom ordered.
(11) The replenishment order number (see use under No. 1 above).
(12) The signature of the purchasing agent.

The matter listed under numbers 1, 2 and 7 as far as standard shipping and billing directions go, may, of course, be printed on the form when it is set up, as the form in Fig. 7 shows.

The purchase order must be made in varying numbers of carbon copies according to circumstances and procedure. Ordinarily as a minimum there must be the following:

(1) The original copy to be mailed to the vendor. Fig. 7 shows a form for this copy.
(2) A copy for the requisitioner.
(3) A copy for the purchasing agent's office to be filed by the serial number of the purchase order.
(4) A copy for the purchasing agent's office to serve as a follow-up tickler. Fig. 8 illustrates a form for this use.
(5) A copy for the balance and receiving men.

In addition to these, various other copies may be needed; for instance, one for each department foreman who is to work upon the material ordered, one for the auditor, and so on. Ordinarily, however, the five copies listed serve as a simple and effective basis for strict control and follow-up.

The purchasing agent's obligation should by no means cease with the dispatch of the purchasing order. Upon him falls the duty of specifying the time necessary to renew. His responsibility, therefore, commences with the receipt of the replenishment order and continues until the goods are laid down at the factory door in the time allotted. It therefore behooves him not only to allow himself plenty of margin in quoting such delivery time, but also to notify the production department immediately if for any reason he receives a replenishment order calling for delivery at a date which he knows cannot be lived up to. His acceptance of this date throws upon him the responsibility of having the goods on hand at the time set provided the request is made within the allowable time.

In order that all data in regard to each transaction be readily available, and that adequate supervision of outstanding orders be possible, it is necessary first that an automatic follow-up of each order be secured, second, that complete information covering the articles ordered themselves and the amounts of various articles outstanding with any vendor be obtainable, and third, that adequate files of catalogs, specifications, quotations and similar material be readily available.

The uses of the copies of the purchase order enumerated above by which this follow-up of each order is obtained are as follows:

(1) The original goes to the vendor and should leave no doubt in his mind as to exactly what and how much is wanted, when the shipment is desired and how it is to be made, and terms of purchase. The form in Fig. 7 provides for these details.

The Requisitioner's Duty

(2) When the requisitioner's copy reaches him, it is the requisitioner's duty to check its accuracy and to report back immediately to the purchasing agent if it is not satisfactory in every way. His failure to do so throws back upon him the responsibility for mistakes in the order itself, since the purchasing agent becomes relieved of this responsibility by forwarding a duplicate copy of a correct transcription of the replenishment order.

(3) The purchasing agent's copy should be made out on paper suitable for permanent filing by the purchasing order number in a loose-leaf binder, where each new order should be filed by serial number when issued. On this copy may be entered all notations of the action taken in the case, so that a summary of all transactions may be instantly available. If the terms of purchase are modified after the original order has been mailed, if a new delivery date has been agreed upon, or in fact if anything has occurred to modify the original agreement, notation to this effect should be made on this copy. Progress of fulfillment of the contract should appear here, and when it has been completed this copy should be so stamped. It remains as the permanent purchasing office record of the transaction, supplemented by correspondence and other matter in the letter file.

(4) The purchasing agent's tickler copy: Every purchase order sent out should have a delivery date indicated on it. This date may be of vital concern or of comparatively little moment as the case may be. Nevertheless, some date must appear. This date, moreover, must go out with the expectation that the vendor will live up to it or notify the agent to the contrary immediately upon its receipt or when he finds it impossible to do so. The burden of the follow-up, however, must rest upon the purchasing agent, since no

one will look after our business for us if we fail to do our part.

Depending upon the urgency of the order, therefore, the purchasing agent will enter a date on the tickler copy when he wishes the transaction brought to his attention. The form in Fig. 8 allows space for several of these dates. The date of delivery may be, say, August 1, and since it is imperative that the goods be received not later than that date, it is desirable to follow up the order on July 25. This date, July 25, would then be entered as the tickler date.

The tickler copy would then be filed in a special tickler cabinet with drawers and guides for each month of the year and folders for each day of the month. When July 25 arrives, the clerk will remove all papers in that folder, which may contain not only this copy of the purchase order but also any other matters to which the purchasing agent desires his attention called on this date. The tickler copy will be laid on the purchasing agent's desk, when he will take up such follow-up measures as he deems desirable.

A form card with an attached reply card to give the required information has been found satisfactory for this purpose, and results in a considerably higher percentage of replies than where the routine formal letter is used, requiring on the part of the vendor the repetition of information identifying the order.

When the delivery of an outstanding order is delayed, or when the purchasing agent obtains the information that it will be delayed, he must immediately notify the requisitioner to this effect. Of course, it may not be considered necessary to follow every order before shipment is due from the vendor, for to do so entails much additional work. On the other hand, some plants find it advisable to systematically follow-up all orders three or four days before they are due. Such procedure is recommended particularly during upset traffic conditions.

In any event, however, the purchasing agent is not ordinarily in a position himself, and should not be expected to differentiate between those articles for which there is urgent need and those which may come along somewhat after the date promised. If delivery is to be delayed he must immediately send a notice to that effect to the requisitioner. Then, according to the requisitioner's reply as to the urgency of delivery, he may deal with the exceptions only, letting the shipment go for a few days or bringing all possible pressure to bear for quick delivery as the particular case demands.

After the follow-up is obtained and a new delivery date is set, another follow-up date is entered on the bottom of the tickler copy and it is again filed under that date, and when shipment is complete it may be destroyed or otherwise filed as desired.

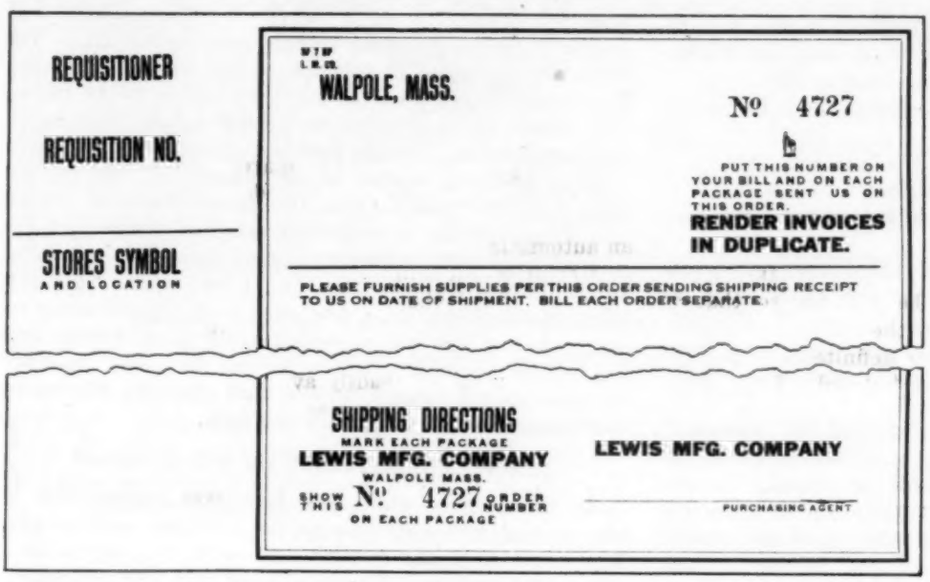

REQUISITIONER
REQUISITION NO.
STORES SYMBOL
AND LOCATION
WALPOLE, MASS.
Nº 4727
PUT THIS NUMBER ON YOUR BILL AND ON EACH PACKAGE SENT US ON THIS ORDER.
RENDER INVOICES IN DUPLICATE.
PLEASE FURNISH SUPPLIES PER THIS ORDER SENDING SHIPPING RECEIPT TO US ON DATE OF SHIPMENT. BILL EACH ORDER SEPARATE.
SHIPPING DIRECTIONS
MARK EACH PACKAGE
LEWIS MFG. COMPANY
WALPOLE MASS.
SHOW THIS Nº 4727 ORDER NUMBER ON EACH PACKAGE
LEWIS MFG. COMPANY
PURCHASING AGENT

FIG. 7. A FORM FOR THE ORIGINAL PURCHASE ORDER COPY FOR THE VENDOR

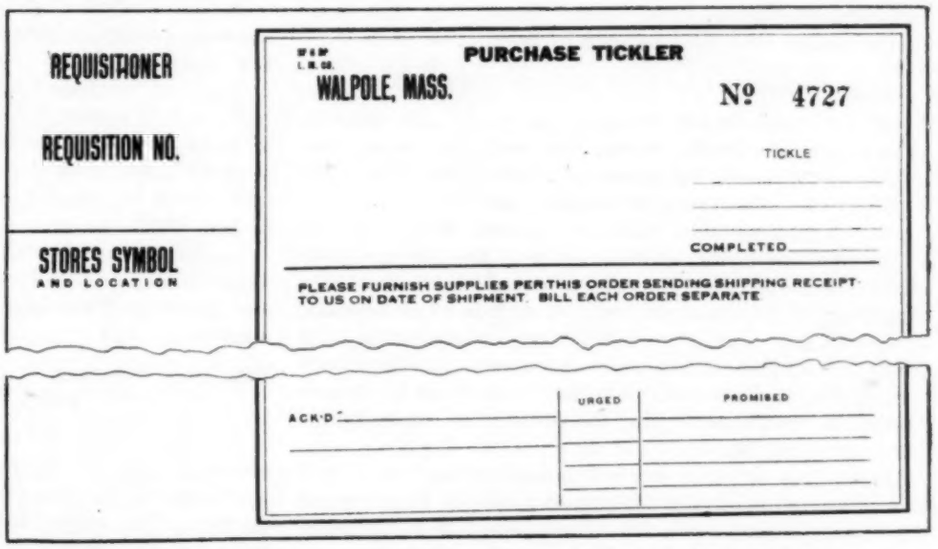


FIG. 8. A FORM FOR THE TICKLER COPY OF THE PURCHASE ORDER

(5) The receiving clerk's copy of the purchase order may first be sent to the balance clerk for posting to the proper balance sheet, either classified or unclassified. It then goes to the receiving man who posts it temporarily for the inspector to note and then files it by the name of the vendor. A separate copy may also be made for information and retention by the balance clerk.

It is well to let the inspector look over the receiving man's copy of the purchase order as soon as it is received, particularly in the case of large orders, so that he may make arrangements for the inspection

himself, delegate this work to another, or give any necessary directions.

Before taking up the final stages in the purchasing department, that is, the routine after receipt and notification of goods received, the other records necessary to adequate purchasing regulation may be pointed out. We have described so far, and quite fully, the following records:

(1) Original replenishment order: After the resulting purchase order has been made out, this replenishment order is filed by date of requisition.

(2) Copy of the purchase order filed by serial number.

(3) Requisitioner's copy of the purchase order.

(4) Tickler copy of the purchase order.

(5) Balance and receiving clerks' copy of the purchase order.

In order to make the data of all transactions available, it is necessary further that the purchasing department have records as follows:

(6) An alphabetical letter file for correspondence with the various vendors: This file should be supplemented by a tickler file.

(7) A card index or other record by material: These records may be filed by name of material, or preferably by symbol if symbols are used. In any event, this form should show description of material, dates of various replenishment and purchase orders, from whom purchased, quotation and delivery. Such extensive data are unnecessary in the smaller plants and I have found some purchasing offices conducted satisfactorily where this record shows only the name of the article and the changes in price.

A Vendor's File Not Always Necessary

(8) A vendor's file, showing the name and address of each vendor with whom the company deals, the articles purchased, the terms and deliveries: This record may be unnecessary in smaller plants.

(9) A catalog file: Some systematic method should be adopted for filing catalogs, since in the average purchasing office constructive use is not made of them due simply to their inaccessibility. A system of numbering at least each catalog should be employed, and a card index by article should refer to every catalog where this article is described. Another card index by manufacturers should show the file number of each manufacturer's catalog.

Depending on the type of balance sheet used and the information which is summarized on it, some of the above records can be eliminated. For instance, suppose it is desired to find the names of the various vendors from whom we have ordered a certain article during the past year. Instead of requiring the purchasing agent to keep such data, we may request the balance clerk to give us from the proper balance sheet the purchase order numbers for each purchase of this article. These will enable us to turn at once to the copy of the purchase order filed by serial number. Similarly, information covering promptness of delivery may be obtained from the balance record.

No attempt is made here to specify what shall and what shall not be kept in each place, since this is a question to be determined in each case and depends on various factors. With these records, however, or with suitable combinations or substitutes, any question in regard to material, vendors, prices, or follow-up may be readily ascertained.

Prospective Machinery Markets in China

By W. C. Murphy
Treasurer, Providence Mill Supply Co.

A recent six-months' trip to the Far East has given me some first-hand information on machinery markets there which may be interesting to your readers. In what follows I have set down a few impressions as they occurred to me.

The things to consider in this proposition are: The monetary situation as relating to the rate of exchange, European competition, the mental attitude of the buyer, the matter of credit, the care used in the packing of the merchandise, and the political situation in China.

Take first the matter of exchange. At present the gold dollar is worth twice the silver dollar of China and it can readily be seen that this has a deterrent influence in the fluent purchasing of American goods by the Chinese. As the rate stood two years ago, the silver dollar being on a par with gold, the securing of orders in our line was a comparatively easy matter, and the writer secured some important business, possibly to some extent caused by the fact that the European countries had not arrived in the field.

European Competition on the Increase

At the present time, the European competition is strong and will continue to be stronger and keener. With this to contend with and with the depreciated value of the silver dollar, our recent trip was not nearly so successful as that of two years ago.

A very important thing, however, is the fact that the Chinese generally have a very friendly feeling toward the Americans and American merchandise and the attitude of the buyer indicates a strong desire to trade with us. We were told on various occasions that they liked to have us come to China and wanted to do business with us because we did not come to exploit their country or to ask for special concessions or privileges of any kind.

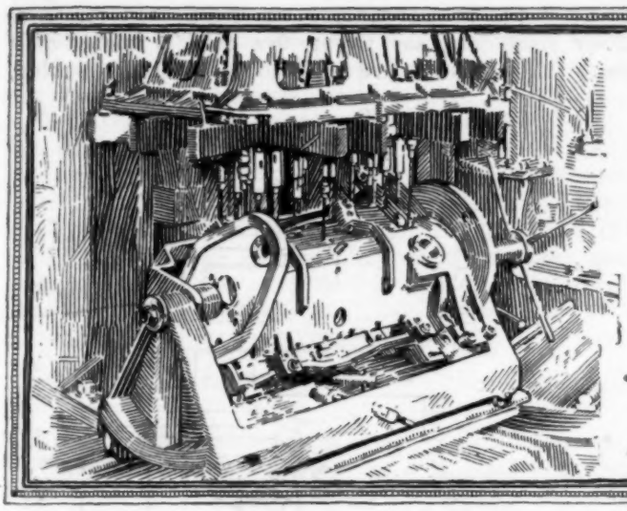
In the matter of credit, the Germans and English are very lenient, especially the Germans, and arrangements are made so that long terms and easy payment are allowed.

European Shipper Packs His Merchandise Better Than the American

Another thing in which the European shipper is ahead of us is in the packing of the merchandise. He exercises far greater care than we do in this important matter. The writer talked with the American Consul in one of the large Chinese cities and was informed by him that he was constantly taking up the matter of claims of the native merchants who had received goods in a damaged condition on account of inferior packing.

There seems to be plenty of money in the Orient and a strong desire to invest in manufacturing enterprises, particularly textiles and metals, but the greatest drawback is the instability of the government and the consequent fear of internal strife which carries with it the possibility of property destruction.

When this great and wonderful land of nearly five hundred million people gets straightened out, and a united national spirit is established, what a market there will be. With the feeling toward America that now exists among the Chinese, it would appear that the securing of a large proportion of this huge business depends largely upon ourselves.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
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Tooling Vertical Turret Lathes and Boring Mills — Points of Importance in Design of Chucks and Faceplates — Special Fixtures for Holding Irregular Work

IN OUR previous articles we have described methods of handling work on turret and engine lathes. These machines are used for work up to 16 or 18 in. in diameter, and occasionally for pieces of even larger size. For heavy work of large diameter, and even for some kinds of work of comparatively small diameter, the vertical turret lathe and vertical boring mill are more suitable. One of the principal reasons for this fact is the difficulty experienced in chucking large and heavy work on the horizontal type of machines.

It is necessary to discuss the relative merits of vertical and horizontal types of machines for boring, turning and facing, as the field of one overlaps that of the other to some extent, so that it becomes largely a matter of the selection of a machine most suited for a given piece of work. Speaking generally, the vertical turret lathe and vertical boring mill are suited to heavy work requiring the removal of considerable stock. Machines of this type are very powerful and adapted to heavy cutting with corse feeds. The tools and fixtures for vertical boring mills bear a strong family resemblance to those used on turret lathes; they are, however, considerably heavier and capable of withstanding greater pressures.

There are several types of vertical boring machines, differing from each other in their general details of construction. One of these types is the vertical turret lathe, another the vertical boring mill, another the multiple-spindle semi-automatic chucking machine. The first of these approaches the horizontal machine most closely in its general features of construction. The application of tools is also quite similar, although there are distinct points of difference. In order that the designer may understand the general details of construction of vertical turret lathes and boring mills, a diagram of each type is shown in Fig. 387. These diagrams are not intended to reveal details of the machines, but only to show general points in construction.

The diagram at *A* shows a vertical turret lathe having a heavy table *B* in which chuck jaws are mounted. The turret *C* has five sides and is located on a vertical slide *D*. The saddle *E* slides horizontally along the guides *F*, a positive stop being provided for determining the central position of the saddle. The turret slide is so mounted that it can be swiveled to an angle of 45 deg. on either side of the center line, thus adapting it for angular work. The sidehead *G* is of very heavy construction, and is located on a vertical slide *H*. A four-sided turret toolpost *K* is provided with slots for holding tools.

The speeds are obtained through a transmission gear case and clutches quite similar to the type used for automobiles. A wide range of feeds is obtainable through a gear box conveniently located. The necessary changes can be made rapidly, and suitable markings enable the operator to know just what feeds he is using. The slides have power rapid traverse in order to assist in setting for various positions. Diameter readings are obtained by means of graduated slides, micrometer dials and observation stops arranged so that they can be conveniently read by the operator. The machines are capable of the heaviest kind of cutting on steel and a very high degree of accuracy can be obtained. Machines of this type are made in capacities ranging from 24 to 54 in. in diameter.

The vertical boring mill at *L* is similar in general construction to the vertical turret lathe just described, except that there is no sidehead or turret. In some cases a special slide on this type of machine is furnished with a five or six-sided turret, but this is not standard on all types of machines. The points of difference between the vertical turret lathe and vertical boring mill can be readily appreciated by a reference to the illustration. The table *M* is provided with chuck jaws and T-slots for holding fixtures when necessary. The toolslides *N* and *O* are held in saddles *P* and *Q*, which are adjustable along the horizontal guides *R* and *S*. Occasionally both heads are arranged so that they can be swiveled through an arc of about 45 deg. Standard toolholders with forged tools of suitable shape are located in a hole in the lower end of each toolslide. A positive means of clamping and locating is provided. Rapid power traverse of toolslides and saddle is given, to avoid the necessity for long and tedius hand adjust-

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ments. A wide range of speeds and feeds is obtainable through a transmission case, clutch and gear box.

These two types of machines are the only ones for which we shall consider tooling methods. The multi-spindle semi-automatic chucking machine requires special study, and as this work is somewhat specialized we do not feel justified in going into the subject in detail. In general, the principles which we have mentioned and the methods described will apply to all varieties of turning and boring machines, with modifications to suit the different types.

The method of holding work on boring mill tables is of interest, and while the chuck and jaws are similar to those used on a horizontal turret lathe, the application of fixtures to the table is somewhat different. Fig. 388 shows a perspective view of a boring mill table at *A*. This example has a three-jaw universal chuck built into the table. The jaws *B* are held down on sub-jaws *F* by means of bolts shown at *C* and *D*. The table itself is slotted in a number of places, as indicated at *K* and *L*, in order to facilitate clamping work or attaching fixtures. The center hole in the table is often used for obtaining the correct position of the fixture by using a locating plug in the hole.

The jaw arrangement is rather unusual, as each sub-jaw *F* is so constructed that its under side meshes with a scroll ring operated by a pinion. The movement of the jaws is obtained by using a socket wrench on the square head of the operating shaft *H*. Three of these shafts are located in the table so that they are easily accessible. Through the scroll ring the jaws are operated uniformly, but there is also an independent movement of each jaw obtainable by means of the screw *G*. This movement is convenient when chucking irregular work, as it allows the jaws to be set in different positions from the center, yet at the same time they can be operated with a universal movement.

The top of each jaw is grooved deeply across its face, so as to allow various settings of standard jaws. To keep the scroll ring covered and prevent chips from clogging the mechanism of the chuck, the sub-jaws are very long so that protection is assured at all times. The amount of movement of the sub-jaws is small, the top jaws being set in whatever position may be required for holding a given diameter of work. The detail illustrates the method of clamping the top jaws to the sub-jaws.

It must be remembered that the vertical turret lathe or boring mill has a table of large diameter, and it is therefore of great importance that it should be rigid and capable of withstanding a great deal of pressure during the cutting action. The sectional view through the spindle shows the table *A*, on the under side of which is a large bevel ring gear *N* driven by a pinion O. The table is attached to a spindle having a conical bearing seat *P*, which not only stabilizes the table but provides an ideal bearing surface. The hole *Q* in the center of the table is useful in locating fixtures or bushings. A filler plug *R* is placed as shown, in order to prevent chips and dirt from working down into the moving parts of the machine.

Fixtures used on vertical boring mills are for the most part simple in design, although exceptional cases may require a fixture more or less elaborate, according to the nature of the work. Such matters as the production required and the number of pieces which are machined in each lot have an effect on the design of fixtures. A great deal of work which is handled on boring mills is put through the factory in comparatively small lots, say twenty-five or fifty pieces at a time. When fixtures are required for work of this kind,

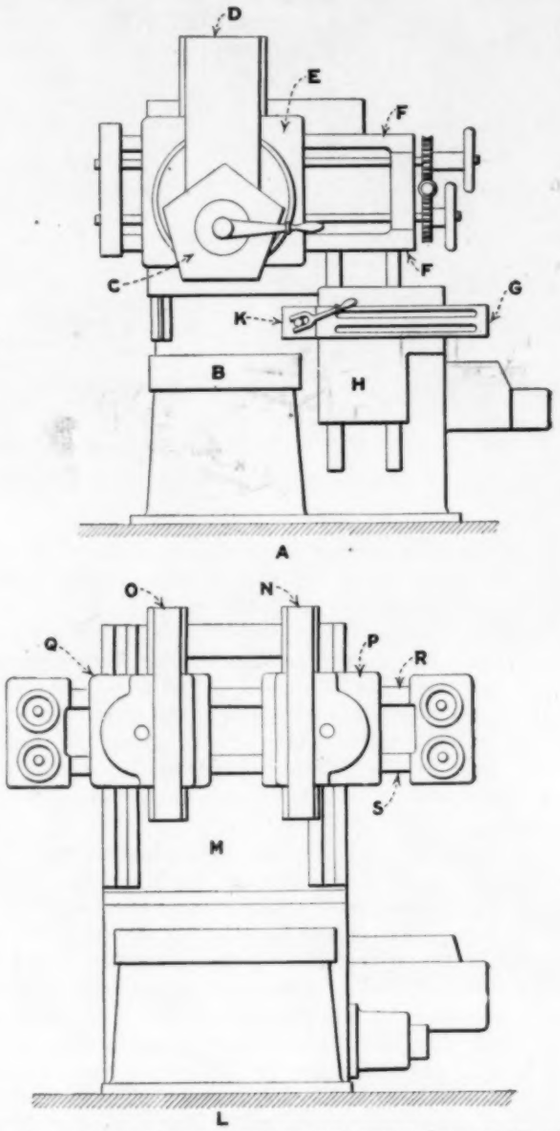


FIG. 387. DIAGRAMS OF VERTICAL TURRET LATHE AND BORING MILL

it is necessary to make them so that they will withstand rough handling and a considerable amount of wear on the various finished surfaces.

General matters connected with the design are much the same as those which have been previously mentioned on the subject of turret lathe fixtures. The only difference is in the size of the parts, which naturally require heavier fixtures and those capable of withstanding more severe usage. The following points must be considered in the design:

(1) The location of the work is of primary importance, whether it is the first setting of a piece of rough work or another setting in which the piece must be located from a previously finished surface. Points of location and surfaces on which the work rests should be made in such a way that they can either be trued up readily to preserve the accuracy or replaced by other units when worn.

(2) The rigidity and driving power of fixtures used for this kind of work is of supreme importance, as the

cuts which are taken are heavy and there must be no vibration if first-class work is to be obtained. Even when work is held in chuck jaws, the shape of the work and the amount of material which is to be removed may make it necessary to provide additional means of holding and driving, in order to withstand the excessive pressure resulting from the cut. There is an old story told of a manufacturer of vertical boring mills; when asked how many machines one man could run he replied that "It takes two men to run one machine, one man to operate the machine and the other to carry away the chips." While we must admit that this statement is somewhat exaggerated, it illustrates the

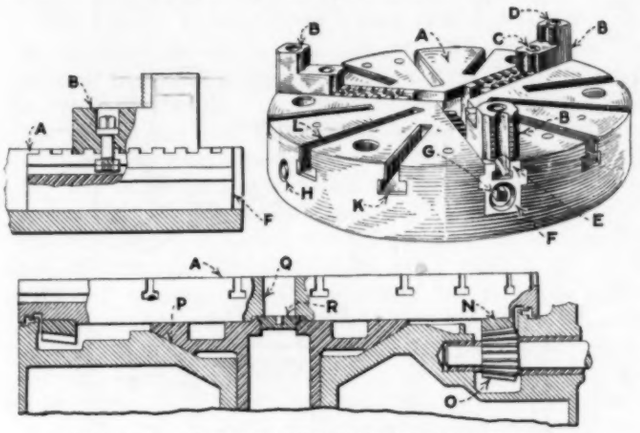


FIG. 388. BORING MILL TABLE AND CHUCK

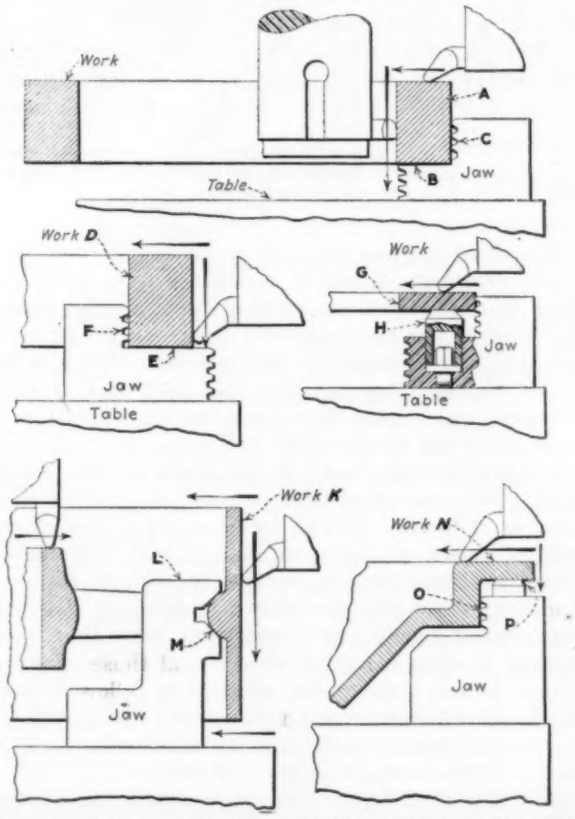


FIG. 389. METHODS OF HOLDING WORK IN CHUCK JAWS

point and indicates the tremendous power and production possibilities of these machines.

(3) Economy in the design of fixtures for vertical turret lathes should be carefully studied, as the fixtures are often so large that the cost of patterns and cast iron alone may be excessive, unless considerable thought is given to the design. Another point in this connection is that the large size of the fixtures makes them somewhat awkward to machine, and it may be better to make them in several units, rather than to use a single casting of large size which would be difficult to machine. The methods of clamping do not generally require much of a special nature, but the necessity for holding the work rigidly makes it obligatory to use clamps to which sufficient pressure can be applied.

(4) Convenience and the accessibility of various movable parts on the fixture are quite important, and should be studied with care when designing. Locating points should, if possible, be arranged so that they can be seen, even if it is necessary to core openings in the side of the fixture to allow the operator to look through and see where he is placing the work. The method of setting up a piece in the fixture should be such that it will be as convenient for the operator as possible. Certain kinds of irregular work may require a fixture having a latch which can be swung to one side when placing the work in position. When anything of this kind is necessary, the direction in which the latch swings should be such that the accidental starting of the machine will not cause the swinging member to come in contact with the sidehead or some other portion of the machine and cause breakage. The pivot should be so placed as to avoid any trouble of this sort.

(5) The removal of chips from fixtures often causes trouble, unless proper provision is made so that they can be readily swept out. A pot fixture, for example, may be excellent for holding the work; but if it is so constructed that it will soon fill up with chips, it will cause much loss of time in manufacturing. Cored openings can usually be provided so that chips will fall out by themselves. The experienced designer takes these points into consideration when making up a tool, no matter whether it is for a jig, cutter or fixture.

(6) The accuracy of the finished product may often effect the design of the fixture; hence, the tool engineer must consider this in the early stages of the design. For important surfaces which are to be machined in accurate relation to each other, the tool equipment must be designed with this point in mind. In the location of the work, also, the matter must be considered and proper methods of clamping and locating used.

Holding Work in Chuck Jaws

A great deal of the work done on the machines of the types just mentioned is held by means of standard or special chuck jaws. We have previously shown a number of applications of chuck jaws to turret lathe work, and many of the points in design mentioned there are equally important for jaws used in holding work on boring mills. One point, however, which is quite different is the fact that the work is held in a horizontal plane, so that it is only necessary to lay it down in the chuck jaws in the proper position, its own weight keeping it in place while the jaws are being tightened.

There are exceptional cases when work is of such shape that it requires a special chucking device on the turret, but these cases are rare and can usually be solved by a designer of average intelligence. Standard chuck jaws can often be used for holding work, unless it is of peculiar shape or would not permit the tool to pass over the surface to be machined if standard jaws were used.

In Fig. 389 are shown a number of examples of

standard and special chuck jaws in their application to various pieces of work. In the example *A* the work rests on the surface *B* of a standard jaw, and is held by the outside as shown at *C*. Since this piece of work is to be bored and faced, as indicated by the arrows, it is clear that these jaws can be used for holding so that nothing special will be required.

In the example *D* the work rests on a standard jaw at *E*, being gripped by the inside as shown at *F*. The work which is to be done is facing the upper surface and turning the outside diameter, as indicated by the arrows. If set up in the manner shown, the outside turning tools could not be used without running into the jaws. It is not by any means necessary, however, to provide special jaws, as raising blocks can be placed under the rim of the work, thus providing clearance between the jaw and the work so that the tools can pass by. Another method of holding a piece of work in order to allow clearance for the tool is shown at *G*. Hardened buttons *H* are placed in the bolt holes of the jaws, and the work rests on these buttons.

The work shown at *K* is a large pulley which is machined on the outside, the two rims, the hub and the hole. In order to hold the rim so that these surfaces can be finished in one setting, a special form of jaw *L* is used. This jaw is cut out in V-form, as shown at *M*, so that it grips the inside of the flange and at the same time locates it in a vertical direction. The example shown at *N* also requires the use of special chuck jaws on account of the shape of the work. The jaw is made so that it grips the piece at the point *O*, and the flange rests on a hardened stud *P* on top of the jaw.

It must be remembered that the chucks on these machines are very powerful, and that, therefore, care must be used in gripping the work so that it is not distorted and thrown out of shape by the pressure of the jaws. Special methods may be necessary for thin work, in order to prevent trouble being caused by distortion. Other points in connection with the design of chuck jaws have been fully treated in our previous articles. Cases which require special treatment can usually be handled by an application of principles which have been mentioned.

It is very necessary to make fixtures for vertical turret lathes and vertical boring mills of a substantial nature, so that they will withstand the heavy cutting action. Not only must the fixtures be made strongly, but the method of holding the work must be such that the latter will not turn or change its position when heavy cutting is necessary. Certain kinds of work are of such a nature that they cannot be readily held in chuck jaws, and when such a part is encountered a fixture must be designed expressly for it. An example of this kind is shown in Fig. 390, in which the work *A* is a large cast-iron drum which is to be machined on the top, outside diameter and the flange. On account of the shape of the work it cannot be held easily in chuck jaws, as these would need to be made very high in order to grip the piece securely. The fixture *B* is substantially made of cast iron and located on a plug *C* which fits the center hole in the boring mill table. The outside diameter of the drum is 19 in. when finished. The drum slips over the central portion of the fixture and rests on three hardened plugs *D*, spaced equidistantly under the flange.

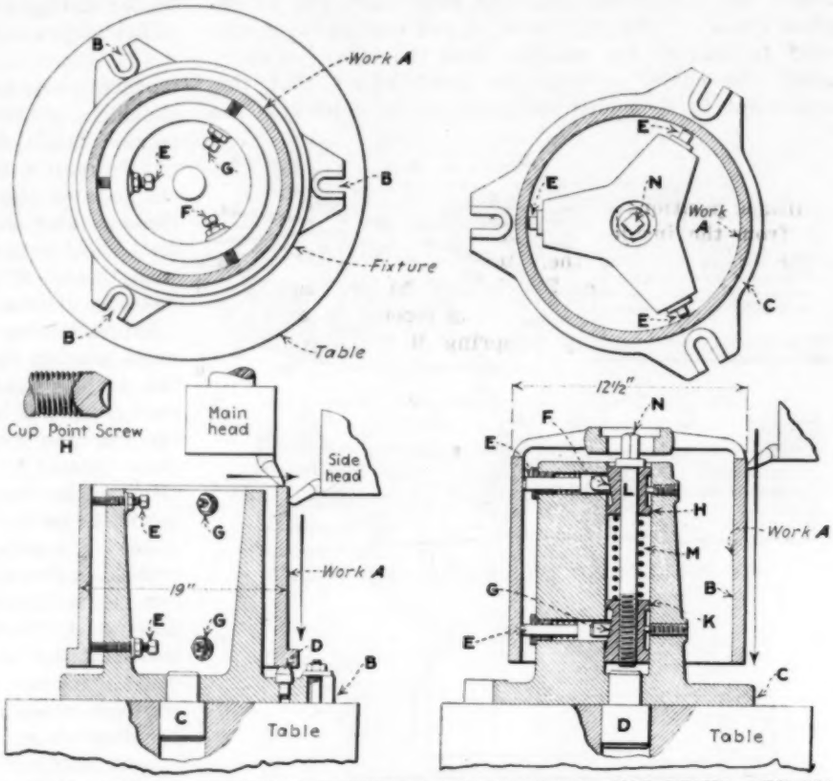


FIG. 390 (LEFT). VERTICAL TURRET LATHE FIXTURE FOR DRUM. FIG. 391 (RIGHT). PIN CHUCK FOR ELECTRICAL UNIT

A central location for the work is obtained by the use of setscrews *E* and *F* which are fixed in position. They are not disturbed when setting up the work on the fixture; but the setscrews *G* are easily accessible, and they are tightened by the operator with a wrench. It will be seen that the principle used here is similar to others which have been described in connection with fixtures for horizontal turret lathes.

A point of importance is the shape of the setscrews used. The cone-point type is unsuited to work of this kind, as it is very difficult to set up this type of screw with sufficient pressure so that it will withstand the vibrations produced by the heavy cutting action. A cup-point screw like that shown in detail at *H* will give much better results, as considerably more than a point contact is obtained from this variety. On short cuts which do not require the removal of a great deal of stock, a cone-point screw may answer the purpose, but for general use a cup point is much superior as its contact with the work is so much greater.

Fixtures used for vertical boring mills are frequently very simple. Oftentimes some of the work required in finishing the fixtures can be done on the boring mill table, which is of course an advantage, as it is then certain that the fixture will run perfectly true with the table. Patterns used for large fixtures are generally simple and they are not finished carefully in the majority of cases. In order to prevent cracks and

ruptures of the castings, all fillets should be made large.

Many cases are found in which it is necessary to hold a piece of work by an inside cored surface, in order that the piece may be finished true and concentric with the inside. The last example showed a simple method for holding work of this nature, but the shape of the piece itself made it possible to use a type of fixture which cannot always be adapted to inside holding. Fig. 391 shows an electrical unit *A*, the inside surface of which *B* is cored out, yet it is not possible for the operator to use a wrench to tighten setscrews as in the preceding instance. A simplified form of expanding pin chuck was therefore designed for this particular casting.

The body *C* is located on a plug *D* in the center hole of the boring mill table. Six pins *E* are spaced in suitable positions to give stability to the work and grip it from the inside. The pins in each tier are placed 120 deg. apart and their inner ends come in contact with angular surfaces *F* and *G* on the two cams *H* and *K*. The latter cam is threaded to receive the end of the operating bolt *L*. A coil spring *M* is placed between the two cams. A socket wrench used on the end of the bolt *N* operates the mechanism, thus moving the pins outward as much as is necessary to hold the work firmly. When the operating screw is loosened, the springs in the pin sockets release the pins, thus allowing the work to be removed.

A principle of a similar kind can be used on work where it is not possible to place a wrench on top of the fixture as in this case. Other means for operating the cams must be devised. Occasionally this is done by means of bevel gears and a socket wrench with a long handle extending beyond the edge of the table. Several methods are possible and the nature of the work governs the type of device found most useful.

Wants Standard Tapers

By C. Franklin Rothera

Head of Machine Department, Quincy Industrial School

While discussing standardization of tapers, will some one please consider the poor teacher of related mathematics for the machine shop? Many times have I fervently prayed for one standard taper, preferably the Jarno. I respectfully invite the gentleman who did not believe in standardization to endeavor to answer the queries of my pupils as to the reason for the differences in the tapers per foot of the Morse taper. Also why the Brown & Sharpe unaccountably jumps from the good standard of half-inch per foot to 0.5161 in. per foot in the No. 10.

I feel rather small when I have to confess to them that it seems like the perpetuation of an error, as also does the great diversity of the Morse tapers. These differences do not, and cannot, give the boys entering the machine trade a very exalted notion of the mentality of the heads of the trade.

I believe that standardization of tapers should come, and quickly, with the Jarno, for standard.

Selling a Tough Customer

By Hiram Strong

When I took the Western territory for H. & N. turret lathes, the fellow who had been there for fifteen years told me there were two places I'd better stay away from if I wanted to save doctors' bills. He'd been thrown out so many times he had callouses on his disposition and no sales to show for his pains.

One of these places was the big Jones Brothers plant where they should have been using twenty of our largest machines. Bill Jones who did the buying was a profane sort of a cuss who took delight in browbeating a salesman if he would stand for it, but he was a capable manager and bang-up mechanic just the same.

Well, my disposition has had to stand some pretty rough treatment and it's still about as healthy as it ever was, so I decided I'd see what I could do out there.

I got precious little satisfaction out of the first ten or fifteen visits I made but after that it got so Bill Jones got used to seeing me. When I'd come in he'd say, "Well, got a chip on your shoulder, this morning?" I'd say, "No, but I'll put one there if you want to knock it off." We had a lot of fights but finally I got a chance to figure on a new job to use four of our big machines. I put in my figures and you can gamble I was pretty sure they were right.

He looked over the figures. Then he burst out, "You know d—— well you can't do that!" I came right back at him with, "I know d—— well I can." Well, he fussed and fumed until finally I said, "What are you arguing about? It's up to me to worry about that performance, not you. Put it in writing if you want to."

At last he told me to go ahead and put in the four machines so he could prove I was a liar. That was all I wanted. When they came they had been run in and tested until they were as smooth as grease and I had the best two demonstrators from our shop to run them. I insisted that the Jones people get four days' work piled up around those four machines so there wouldn't be any hitches and then we started.

Things got going pretty good by afternoon of the first day and the word got around the shop that something was doing. Next day we did some better and Bill Jones was down there with a stop watch dancing around from one machine to another and looking sort of upset. I kept away from him until we were all through and checked up and could prove we had done 20 per cent better than my figures. Then I sent in my card.

He called me in and before I could get out a word he said, "Huh, come up here to say 'I told you so' haven't you?" "Yes," I said, "I have; what about it?" "You're all right," he replied, "I didn't think you could do it, but I take my hat off to you, those machines stay and I'll want some more before long."

I've never had any trouble getting orders out of that plant since, but can you imagine my chances if I hadn't made good on that job?

Features of the Reo Apprentice System

The Knowledge That Many Reo Executives Are Graduates Acts as an Incentive to Earnest Effort

SPECIAL CORRESPONDENCE

COURSES in apprentice training vary in many shops and it can be said that their success depends largely upon the attitude of the officers of a company toward the work. Where the training course is installed because it seems necessary in order to get boys, or because it seems the fashion, as in some cases, it is apt to be perfunctory and can hardly reach its maximum value.

One of the outstanding features of the apprentice system at the Reo Motor Car plant in Lansing, Mich., is the great personal interest taken in it by the officials of the company. R. H. Scott, vice-president and general manager, H. T. Thomas, chief engineer, and H. C. Teel, factory manager, served full time as apprentices. A. A. Lauzun, general superintendent, and George Rosa, toolroom superintendent, both well-known executives, served their apprenticeship under Mr. Teel and nearly all the division superintendents and many of the foremen were also apprentices.

With such examples of possible advancement to look forward to, such evidence that men who really learn the trade are sought after by the management for responsible positions, it is little wonder that the apprentices are enthusiastic and interested in their work.

There are three courses of study, each designed to meet specific conditions. The first or junior apprenticeship course takes boys from 16 to 20 years of age and with schooling from the eighth to the eleventh grades. This is a three-year course and includes machinists' work, toolmaking, tool and jig designing and drafting. Ninety per cent are taking the machinist course.

The senior course takes men 21 years or over, all returned soldiers or sailors coming in this class. This is a two-year course and covers the same subjects as the junior course. High school graduates under 21 years form a third class, with a 2½-year course on the same subjects as the others. Students sent by the Federal Board for Vocational Education come under Class II, the length of the course being determined by the Federal Board.

Each apprentice has a trial period of three months. If things are mutually satisfactory, he is asked to sign an agreement to serve the full course of apprenticeship. Graduates are guaranteed good positions with the Reo company, although they are of course free to go elsewhere if they desire.

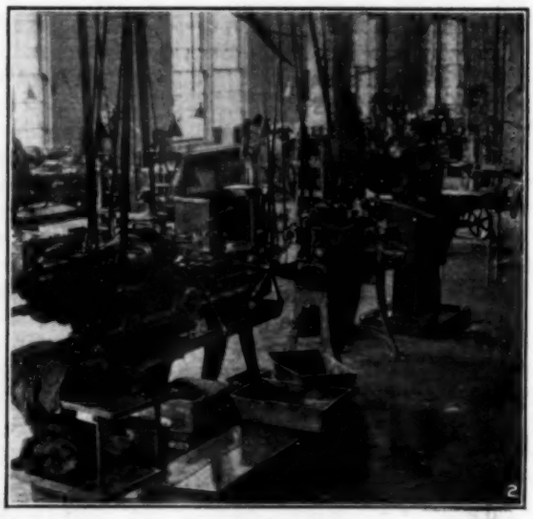
Courses in the trades mentioned vary with the individual. The course of each apprentice is outlined according to his inclinations and ability. Shop work consists of:

Inspection	2 to 3 months
Milling machine	3 to 5 months
Grinding	2 to 3 months
Bench	2 to 3 months
Motor assembly	3 to 4 months
Drafting	6 to 12 months
Motor test	
Chassis test	
Drilling	2 to 3 months
Gear cutting	3 to 5 months
Lathe	4 to 6 months
Axle assembly	2 to 3 months
Final assembly	3 to 6 months
Toolroom work	1 to 2 months
Coupe and sedan test	

The vacant spaces have times which vary with conditions of the work.

The present apprentice school system began Oct. 1, 1918, and is an outgrowth of an older course that was almost wiped out by enlistment and draft during the war. The founder of the movement is H. C. Teel, the factory manager. The number of students varies, the maximum number which can be accommodated being 200. There were 165 on March 1, 1922. The classroom equipment can handle twenty students each half day, the average being 15.2 per class.

The training shop has forty machines of various kinds for instruction purposes, valued at approximately $10,000. Figs. 1 and 2 give some idea of the varied equipment provided. The shop also acts as a sort of reservoir, apprentices who have no work in their de-



FIGS. 1 AND 2. TWO VIEWS OF THE MACHINE EQUIPMENT OF THE SCHOOL SHOP

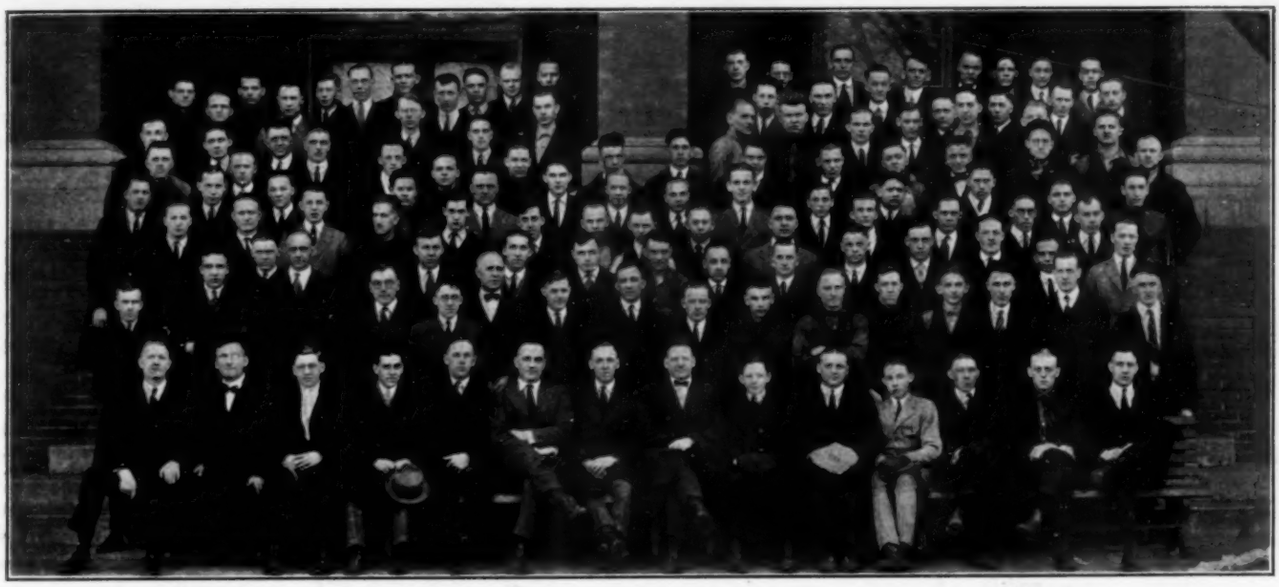


FIG. 4. A GROUP OF REO APPRENTICES

partments in the shop return to the training shop for further instruction.

The text books used are "Palmer's Practical Mathematics" (4 vols.), and the "American Machinists' Handbook." Twenty-six special lesson sheets on the latter have been prepared to show the boys how to find data in, and to otherwise use, the handbook to the best advantage. These lessons are mimeographed and consist of from six to twenty questions on various subjects. The solution of each problem is placed on the blackboard and is discussed by the class.

FIG. 3. LEARNING INSPECTION AND THE USE OF INSPECTION GAGES

In addition to the regular apprentice course, a night school is held in the apprentice department in connection with the public school department of Lansing. This covers twenty weeks.

Interest is maintained in the advanced apprentices by giving them opportunity to carry work through various stages and to make designs for simple jigs, tools and fixtures. They also repair machine parts, cut gears, make blueprints from their own tracings and machine parts complete in the apprentice shop. The apprentices work in all departments of the factory, and have the co-operation of all shop executives. One room is especially equipped for instruction on automobiles, and contains motors, axles, transmissions, electrical equipment and a complete chassis of both the passenger car and the speed-wagon.

Careful records are kept of each boy's progress and reports are sent to parents or guardians every three months. Those interested in the boys are urged to visit the plant and see the conditions under which they work. Records of apprentices who have completed the course are on file with the factory superintendent, the employment superintendent and in the apprentice department. These records show the time spent in each department and the rating in each. The complete record card is about 10 in. square and has room for a three-year record in both school and shop. These records make it possible to see at a glance just what each boy's progress has been from start to finish.

A good idea of the training given in inspecting and checking both rough and finished work is shown in Fig. 3. This room is for the more advanced students, all of those shown being ex-service men. Fig. 4 shows a group of 125 apprentices together with a few instructors, in front of the administration building.

Comparison Chart on Screw Threads

The Bureau of Standards of the Department of Commerce has just issued a chart entitled "Graphic Comparison of Screw Thread Pitches," which is now ready for distribution to anyone interested. Copies of this chart may be obtained by addressing the bureau. The chart is accompanied by a table, which shows the relation between English and metric screw thread pitches. Measurement of an English screw thread is ordinarily expressed in terms of the number of threads per inch, while in the case of metric threads the same thing is expressed in terms of the distance from one thread to the next, measured parallel to the axis; that is, in terms of the pitch. In this chart, a simple method has been devised for finding the nearest equivalent to one distance in terms of the other. The table is provided to give extreme values which cannot be conveniently shown in the chart.

Molds for Aluminum Castings

Brass Foundry Practice Modified for Light, Brittle Aluminum—Advantages of Green Sand Cores—Die Castings Stronger—How To Test Aluminum Castings

FROM SALES DEPARTMENT CONDENSED DATA PREPARED BY THE TECHNICAL DEPARTMENT, ALUMINUM COMPANY OF AMERICA

ALUMINUM can be cast by the same general methods used in the casting of brass and bronze, but with certain modifications dependent upon its various physical properties. The purpose of the following information is to point out where these changes in method should be made and to state in general what is considered the best practice. In the selection of molding sand for an aluminum foundry the texture or mechanical composition of the sand is much more important than its chemical composition. A good molding sand should be neither "close" nor "open." If it is too fine it will not be free-venting and will, therefore, prevent the escape of air, steam and gases. On the other hand, it should not be too coarse or it will fail to give a smooth and clean surface to the casting.

The sand most generally used in aluminum founding is Albany OO molding sand. The clay in this sand forms such a good natural bond that no artificial binder, such as flour, treacle, dextrin or sulphite-lees, is needed. All that is necessary is to riddle the sand through a No. 4 sieve to remove all large foreign substances, to moisten it and to thoroughly mix it; then it is ready for use. Just enough water should be added to the sand to give it the required bond; additional water only obstructs the escape of the steam generated and the gases given off by the molten metal.

No specially prepared facing sand is required. When riddled through a sieve ranging in size from No. 8 to No. 20, depending upon the casting in question, the regular molding sand makes a good facing for the pattern. Additions to the sand for the purpose of forming a smoother surface for the mold and increasing the bonding qualitis of the sand, are harmful, for they make the sand impervious to steam and gases. The practice of facing the pattern with good sand and using almost any kind of sand as a filler-up is a bad one. The saving realized in the cost of sand is more than offset by the loss in defective castings due to poor molds.

The usual method of putting the new sand into service is to add small quantities of it at frequent intervals to the old sand. With each additional use the molding sand loses some of its bond. The molten metal drives off the water and kills the clay which comes in immediate contact with it. The water bond is easily replaced by the addition of more water each time the sand is used, but due to the loss of clay, a gradual wastage in the strength of the sand takes place. The sand must then be revived by the addition of new sand, and so a few shovelfuls of the new molding sand are thrown into the old pile of sand whenever it exhibits signs of weakness. Inasmuch as sand tempers best when it is steaming, water and new sand are usually added immediately after the castings have been shaken out.

Careful observation of the two following characteristics of the common aluminum alloys will obviate most of the troubles of the molder: Aluminum alloys are light, for iron or brass are two to three times as heavy; and they are brittle or "hot short" at temperatures slightly below the melting point. In casting aluminum practically every modification of the usual brass foundry practice is attributable to one or the other of these reasons, and any steps taken which provide for these peculiarities are in the right direction. A consideration of the first characteristic will explain why certain practices in ramming, venting, gating, and feeding the mold employed in brass foundries cannot be used unmodified when casting aluminum. Aluminum is so light that it cannot rid itself of absorbed gases and drive off the steam as readily as brass. Observance of the second characteristic will prevent cracks in the castings due to hard cores or molds. If the cooling metal when in its "hot short" condition encounters very much resistance to further shrinkage it will almost invariably crack.

Because of the lightness of aluminum alloys the mold may be made in a snap flask which may be removed when the mold is completed. The sand should be rammed as lightly as is consistent with safe handling and pouring of the mold. Additional ramming serves only to create an impervious wall which will prevent the escape of the imprisoned air, steam and gas, forming blowholes, and producing a rough surface to the casting because the metal cannot lie close to the mold. Hard ramming is also objectionable as it prevents the mold from giving when the metal shrinks, for it must be remembered that certain parts of the mold, as well as the cores, are called upon to give way to the metal in contraction. To help the mold to keep its shape after the flask has been removed, the outside of the mold may

ALUMINUM IS LIGHT in weight and is brittle at a temperature slightly below the melting point. Provision for these two characteristics will obviate many of the aluminum molder's troubles.

Molding sand should provide for the escape of air, steam and gases, but should give a smooth, clean surface.

Chills and risers prevent sponginess and cracks.

A core should be hard at ordinary temperature, but should soften and crush with intense heat.

Small die castings are stronger than sand castings. They also have a greater elongation, more accurate, uniform dimensions, smoother surfaces; and can be produced in large numbers at a lower cost.

be rammed fairly hard, but the hard ramming should never extend to the sand immediately adjacent to the pattern. A close adherence to the principle of light ramming will probably obviate most of the aluminum molder's troubles.

The mold should be well vented for the same reason that the sand should be rammed lightly. In the case of large castings especially, the minute openings resulting from the porosity of the molding sand are an inadequate outlet for the steam and gases, and venting must be resorted to. For small castings vents are often unnecessary.

Low Gates and High Risers

No set rules can be laid down to govern the number, size and location of gates, for each particular casting presents a different problem. This must be left largely to the discretion of the molder, who should always bear in mind the two characteristics of aluminum alloys before mentioned. One or two general suggestions, however, may be given. A liberal fillet should always be employed where the gate connects with the casting in order to avoid drawing just beneath that point. If increasing the size of the fillet does not entirely eliminate trouble from drawing, the gate should be so located that the unsound part of the casting caused by the draw will do the least amount of harm. If possible, it is also good practice to so locate the gate that when the mold cavity is filled with metal, the length of the path traveled will have been such that the heavy sections will have filled first and will be colder than the light sections. It is also generally true that the gate should enter the casting at a low rather than high point, for less air is imprisoned in the mold by gradually rising metal than by falling metal. Due to mechanical difficulties, however, all these suggestions are subject to a limited application.

Risers are usually attached to those parts of the casting which solidify last. The parts which first solidify draw metal from the larger, slower-cooling sections, so the latter sections must find a source of supply sufficient to provide metal for both its own shrinkage and that of the smaller fast-cooling sections. Risers are constructed to create such a source of supply. They must be so located and of such a size that they will remain molten longer than the casting. Otherwise, they simply act in the same way the small sections of the castings do, and draw metal from the large section, making matters worse rather than better. If possible, the riser should enter the casting at its highest point so that the air and dross may be forced up into the riser instead of being trapped in the casting. By increasing the height of the riser, the pressure of metal may be increased, and consequently, sounder and sharper castings will result. On small castings risers are seldom necessary.

Chills may also be used as a safeguard against injurious shrinkage, especially in large castings of irregular section. Where light sections of the casting join heavy sections, uneven cooling takes place. The light section cools first and, in cooling, is fed with metal from the still liquid heavy section. When the heavy section finally cools it draws from the light section, causing sponginess and sometimes cracks in the junction between the two. To correct this tendency some means of artificial cooling must be adopted which will make the heavy section set as fast as the light section. Chills are used for this purpose, and the pieces of metal are so placed in the surface of the mold that they will come in immediate contact with the heavy section of the casting.

It will thus be seen that chills serve much the same purpose as risers, the difference lying principally in the method employed. Risers prevent sponginess and cracks in the junction between two sections by supplying the larger section with molten metal as it shrinks, while chills accomplish the same result by making the two sections cool at an equal rate. Chills are also used for other purposes. They are often employed to give a hard, smooth surface to certain parts of the casting. A harder surface than is usually produced is often necessary if a part of the casting is to be subjected to unusual wear, while a smooth surface often eliminates machining.

Cores for aluminum castings should be made as soft as is consistent with safe manipulation. Because of the "hot short" condition of alloys at high temperatures, it is particularly important that they give way to the shrinkage of the cooling metal. A good core should be hard enough to be safely handled at ordinary temperatures, but should soften and crush when subjected to the intense heat of the molten metal, since the slightest resistance to the shrinkage of aluminum when it is in this fragile state, will usually result disastrously.

A good core sand should consist of a mixture of sharp sand and molding sand in varying proportions, held together by some such binder as rosin, flour or core oil. The sharp sand furnishes good venting qualities to the mixture. The molding sand adds strength to the cores before they are baked and produces a smooth surface to the casting. Rosin is probably the best binder to use, for on coming into contact with the molten aluminum it softens, permitting the core to give as the casting shrinks. In some core sands a small amount of flour is used in addition to the rosin to assist in binding the mixture together until the cores are baked. The rosin has no binding power until it has first been melted and then allowed to harden. Linseed oil and various patented core oils are also successfully used as binders by some foundrymen.

A sand mixture for cores that will crush and prevent cracking is composed of the following ingredients:

Sharp Sand	45 parts
Molding Sand	45 "
Powdered Rosin	2 "
Flour	1 "

After this mixture has been moistened to the correct degree of dampness, it is ready for use. The core should be rammed lightly and should be freely vented. This precaution is more important in the construction of the cores than of the mold proper for, unlike the mold, the core is almost completely surrounded by the metal. The completed core should be sprayed with molasses water, baked in an oven hot enough to melt the rosin thoroughly, and then given a soapstone wash to secure a smooth finish.

Green sand cores are molded from the regular sand which is used for the mold itself, and require no binder other than water. They are skin dried with a blow torch, immediately before setting in the mold. At present green sand cores are used principally for large body cores in casting automobile crankcases and oil pans. With proper development there is no reason why their use cannot be greatly extended to such parts as

manifolds, bearings, flywheel housings, and gear cases. They can not be used for small cores of intricate shape for ramming up, nor in places where the core print support is limited in size or position.

A comparison of the costs of each type shows:

Labor of ramming and rodding each type to be about the same.

A saving in the case of green sand cores due to: Elimination of trucking from core bench to rack, to oven, and from oven to cleaning bench and to stock racks; elimination of baking; elimination of binders other than water.

Green sand cores require less cleaning and patching and can be handled with less breakage.

Loss of defective green sand cores is about one-quarter that of dry sand cores.

Green sand cores, since they are made of the same material as the mold, have an equivalent chilling effect which promotes uniform solidification of the metal. Baked sand cores, on the other hand, have but a fraction of the heat absorbing power of green sand, therefore induce non-uniform solidification with the resultant shrinkage crack.

The crushing strength of green sand cores is from 1 to 3 pounds per square inch or about 1/100 that of baked sand cores. This is an important consideration in connection with the very weak condition of the metal just below the solidification point when the solid shrinkage is taking place.

The green sand core is more easily knocked out with some saving in cost as a result.

Green sand cores give a fine smooth surface.

Green sand cores have a few disadvantages:

The breakage percentage of green sand cores in the mold if not carefully set, is greater than that of baked sand cores.

Side draw boxes are generally used for green sand cores, and are more expensive to make and maintain than the rods for dry sand cores.

The design for a green sand core box is usually more intricate than that for dry sand.

Die Casting

The art of die casting is not new. For many years, zinc, lead, and tin have been successfully cast in this manner. Aluminum die castings, however, are of comparatively recent development. A copper-aluminum alloy is most frequently used with copper content running from 8 per cent to 10 per cent.

It would naturally be supposed that castings made under pressure would be dense and homogeneous. On fracture, however, it is found that only the surface or skin of the casting is dense and close-grained while the inner structure is porous. This applies particularly to the larger castings; smaller ones can usually be cast very satisfactorily. Another cause of trouble has been the cracking of the casting due to resistance to shrinkage offered by the metallic cores, but this trouble has been largely removed by the use of collapsible cores.

When properly cast and when too large castings are not attempted, there is much to be said in favor of die castings. They can be produced in large numbers at a lower cost than sand castings. Their dimensions are more accurate and uniform than similar castings cast in sand. In addition, the surface of die castings is so smooth that machining may often be dispensed with where it ordinarily would be necessary. Die castings are also stronger than sand castings and have a greater elongation. Because of these advantages indications point to the more extensive application of die casting in the future to the larger scale production of small parts.

It is important to standardize methods of testing aluminum castings in order that results obtained in one foundry may be comparable with those obtained in another, or that tests made one day may check up with those made at another time. The test specimen recommended by the Society of Automotive Engineers and the one most generally used is a cast-to-size bar $\frac{1}{2}$ in. in diameter at the breaking section and filleted to a $\frac{3}{4}$ in. diameter threaded end. The fillet should not be less than $\frac{1}{8}$ in. radius. The test bar should be cast in sand, the use of chills or artificial means of cooling is prohibited. The gage length for aluminum, should be 2 in. The ends are threaded in order that the bar may be pulled in a self-centering type of machine which exerts a straight pull on the bar.

The American Society for Testing Materials recommends a similar bar, but machined to size rather than cast to size, in order that the diameter at the breaking section may be more accurately measured. In ordinary foundry practice the increased accuracy of the test due to machining the breaking section and threading the ends is not considered sufficient to pay for the cost of machining, and so the test bar is usually cast to size and pulled in wedge grips. Even the ideally designed and cast test specimen is not without its limitations, for it can only be expected to give approximate results for the metal in the casting which it is supposed to represent.

The test bar checks the history of the metal up to the time it goes into the mold. It gives no check whatever upon the molding variables, except when the bar is attached to the casting, when it reflects certain, but not all, of the variables and in addition it gives no check on the design of the casting. The only way in which to secure such checks is to cut the casting up into parts and take test specimens from each part. Such an experiment will indicate considerable variations in the physical properties of the different parts, for unless molding practice and design are perfect the physical properties of a casting are bound to vary from point to point.

These variations are due to shrinkage, gating methods, the chilling effect, the personal element in foundry work and the design. When it is understood thoroughly to what an extent the physical properties of a casting are subject to control by variations in the melting conditions, the molding practice and the design, a long step will have been taken toward a better adaptation of castings to the purposes for which they are intended.

The Foreman and Management

By A. W. Brown

In one sense, the foreman is part of the management; in any case he is by no means to consider the possibility of his being arrayed against it, when the interests of employers and workers conflict or give signs of doing so. Having power delegated from above, he should not consider that he has any right to attempt exerting it upwards. He cannot "run with the hare and chase with the hounds"; cannot "be all things to all men" or "carry water on both shoulders."

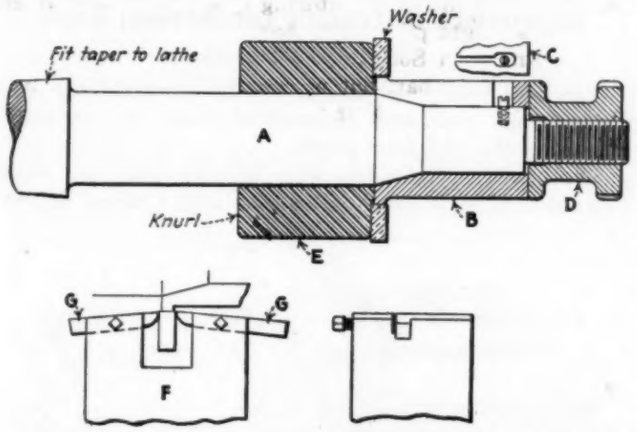
Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Arbor and Toolblock for Facing Thrust Washers

BY K. M. HOLT

The arbor shown in the accompanying sketch was used for facing brass alloy thrust washers 3½ in. outside diameter, 2¼ in. inside diameter and ¼ in. thick.



ARBOR AND TOOLBLOCK FOR FACING THRUST WASHERS

The requirements were that the sides should be flat and parallel with one-quarter of a thousandth, and with a smooth polished surface.

The washers were made from castings and were first bored to micrometer size and faced on both sides in a chuck, leaving them approximately 0.010 in. large in respect to thickness. They were then turned on the outside diameter in gangs on an arbor.

The final facing arbor *A*, shown in the sketch, was centered on both ends and one end tapered to fit the lathe spindle. The other end was machined as shown. A cast-iron expansion bushing *B* was made and slotted in four places as shown at *C*. A small screw pin was tapped into the arbor to prevent the expansion bushing from turning. A hand nut *D* was provided for clamping. The outside diameter of the bushing was turned very carefully to size after slotting and being expanded slightly on the arbor.

A thrust washer was passed over the nut and bushing and located in proper position by means of the sliding sleeve *E*. The hand nut was then tightened to clamp the washer, the sleeve *E* moved to the left out of the way and the tail center brought into position.

The double toolblock *F*, with toolbits *G*, was fastened to the toolpost slide and the lathe geared for a very fine crossfeed.

With the arbor stationary and tools set to give the desired thickness, the toolblock was moved in by hand until the tools were up close to the bushing, the tools passing through radial oil grooves previously milled in each side. The lathe was then started and the tools fed outward by power feed.

With the tools properly ground, no trouble at all was experienced in holding the washers to the desired limits of accuracy and finish with only one passage of the tools, and the entire operation of loading, facing and unloading took only about three-quarters of a minute per washer.

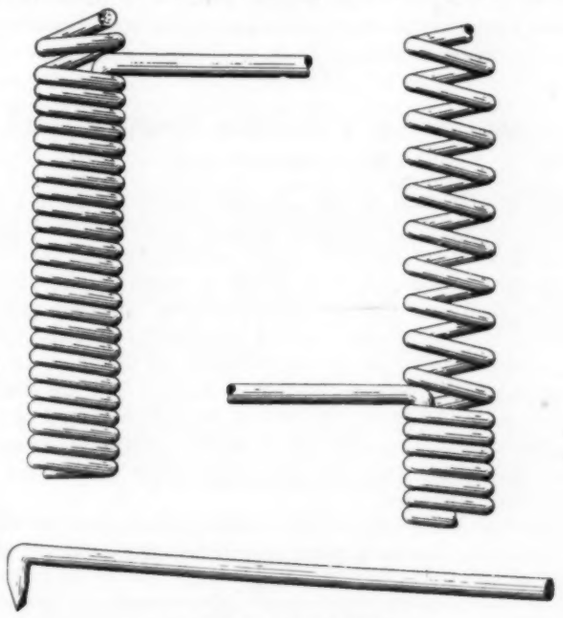
Opening a Coil Spring

BY WALTER E. SCHMIDT

Nearly every machinist has had occasion to open or lengthen a helical spring, and when the spring is tempered and of thick wire it is quite a job by the usual hammer and chisel method, more so when it is a rush repair job. The method I use, while simple, is very efficient and will open almost any helical spring with comparative ease.

Take a piece of round steel or iron of convenient length and bend one end to form a hook; then grind or file the end of the hook to a wedge point as shown in the sketch. With a chisel or other pointed tool pry open the first coil of the spring, insert the wedge end of the hook and force it in until the handle stands at a right-angle. Then clamp the closed end of the spring in a vise and turn the hook in the direction in which spring is wound. The spring will open up with ease.

The diameter of steel used for the hook is governed by the temper, size and length of the spring, or the



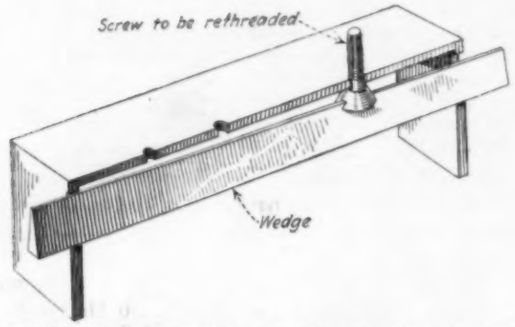
SPRING-OPENING TOOL

pitch of coils desired. I advocate the use of this method only until a new spring of the proper length can be wound.

A Few Kinks for the Machine Shop

By K. Saldiz

A contribution to a recent issue of *American Machinist* advises the use of rubber "wedges" to hold hammer handles in place. It may be of interest to the readers



DEVICE TO HOLD SCREWS FOR RE-THREADING

to know that a properly fitted wooden wedge is much superior to other kinds. The handle should be nicely fitted to the eye of the hammer head, and split by driving in a clean hacksaw blade. The wedge should be coated with shellac and, after driving in place, allowed to dry for a day or two. I have a hammer handle that was so fitted over six years ago and it is still tight.

If a tap binds in cast iron when backing it out of the threaded hole, a little water squirted alongside the flutes will loosen it up and save the tap as well as the temper of the workman.

If a drill binds when drilling aluminum, lubricate it with gasoline. Coal oil will help some but is not as good. If a file clogs when filing aluminum, dip it in lard oil occasionally.

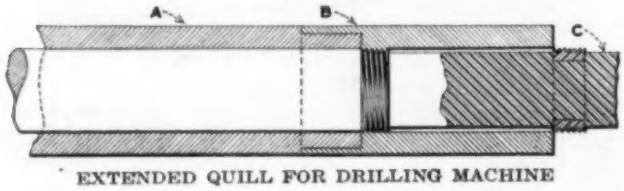
The sketch shows a little device that I made some time ago to assist in re-threading small machine screws. It consists of a piece of heavy sheet iron bent as shown and provided with slots through the legs to admit a wedge. The wedge binds the head of the screw against the under side of the plate and holds any kind of head firmly.

Lengthening a Drilling Machine Quill

By George Wilson

While the quill of the average drilling machine has travel enought for ordinary drilling jobs there are a lot of boring, spot-facing and other machining operations in connection with jigs that could be done if the spindle travel was long enough to permit the removal and insertion of boring bars having comparatively long pilots. A case in point is the machining of pinholes in gas engine pistons where the piston is held in a jig having a drill guide bushing, the drill to be followed by a piloted boring car and reamer, as it is not advisable to swing the table and thus lose the alignments each time the tools are changed.

Having a machine of the sliding head type, in which the spindle was of a good length but the quill too short



EXTENDED QUILL FOR DRILLING MACHINE

for the proposed job, the quill was lengthened as shown in the sketch. The quill *A* was placed on a mandrel and shouldered down on its upper end. A new section of quill *B* was made of machine steel and tightly fitted upon the end of *A*. The new part *B* was left oversize to allow for a cut to be taken off the outside diameter after assembling.

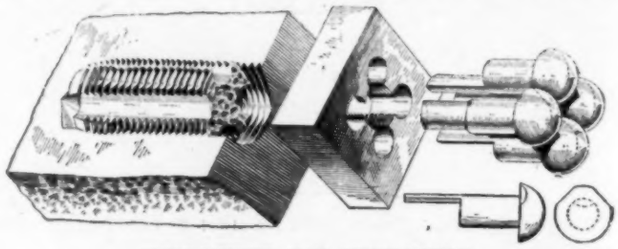
New threads for the retaining nut had to be provided at the end of the extension. This was done by cutting a shallow rectangular shaped groove in the spindle as at *C*. A steel ring was made slightly larger than the outside diameter of the required thread and bored to fit the bottom of the groove. This ring was then split and sweated into the groove with soft solder, after which the spindle was placed in a lathe and the ring turned to size and threaded. The extension was then slabbed off and a new section of rack fastened on.

Improvised Extractor for Broken Taps

By Thomas Davies

The accompanying sketch shows an extractor for broken taps that was improvised from an old solid threading die and four rivets.

The heads of the rivets were of such size that, with two sides of each head flatted, the rivets, when driven



IMPROVISED TAP EXTRACTOR

into the clearance spaces of the die, were locked against turning. The device was placed in the lathe and the shanks turned, as shown in the sketch of one of the rivets, to a diameter that would allow the device to enter the threaded hole, the shanks of the rivets passing into the flutes of the broken tap.

With a wrench upon the square threading die the remains of the tap were easily withdrawn.

A Couple of Shop Kinks

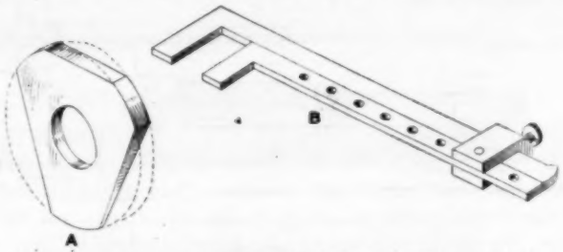
By C. G. Spicer

To make a satisfactory wedge for holding the handle in a hammer, take an ordinary washer of a size suitable to the job and cut it into a triangular shape as shown at *A* in the sketch. By using a file or a disk grinder the lower corner of the crude triangle thus formed can be thinned somewhat until the piece has assumed the shape of a blunt wedge. When it is driven into place in the split end of the handle, the fibers of the wood will sink into the hole and prevent the wedge from backing out. The writer has a number of hammers wedged in this way that have been in service for years.

A cheap and quickly made slide caliper is shown at *B* in the same sketch. The tool is often convenient for the purpose of measuring diameters or distances upon work in confined places that cannot be reached by the ordinary form of caliper. It is not intended as a precision tool.

It may be made of cold-rolled steel of suitable size

by bending over the ends and finishing the surfaces with a file or disk grinder. The yoke must be milled out to go over the slides and is pinned to the lower one. By using a taper pin and making several corresponding holes in the lower slide the yoke may be used anywhere along the length of the slide that may be convenient for the work.



WEDGE FOR A HAMMER HANDLE AND A SIMPLE SLIDE CALIPER

Babbitting Device for Ford Caps

BY WALTER R. PLACE

The cost of replacements for Ford automobiles is so insignificant that one would hardly expect worn parts could be reclaimed at a profit, yet the device here shown for rebabbitting bearing caps has proved to be a real money maker. It was designed by Martin Iblaner of the Lorain Machine Works, Roselle, N. J.

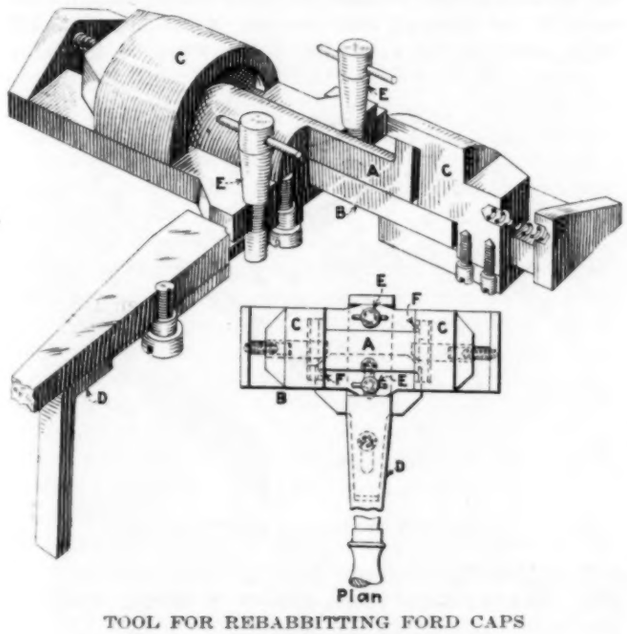
The mandrel *A* is turned to a diameter 0.002 in. under the standard size and the flanges spaced the proper distance apart with the shoulders beveled slightly outward to facilitate the removal of the cap after pouring. This mandrel is secured by screws and dowels, not shown, to the part *B*, which may be considered the base of the device.

Parts *CC* are arranged to slide endwise on the base and are held in closed position by coil springs. They serve to hold the cap in place while the babbitt is being poured and to prevent the liquid metal from leaking out around the end. They can be separated by a movement of the cam plate *D*, located under the handle.

Studs *EE* have tapered bodies which serve to locate the cap in position for pouring the metal. Two small holes *FF* through the base provide gates for casting and also act as air vents. The device is inverted to pour the babbitt.

When the casting has been sufficiently cooled the studs *EE* are removed, the cam plate *D* moved forward by means of the bent handle and the device struck sharply over a block of wood or upon the bench, causing the cap to drop out.

The operations are very quickly repeated and by merely cutting off the two small projections corresponding to the pour holes and scraping the babbitt to fit the shaft, the new cap is ready to go to place.



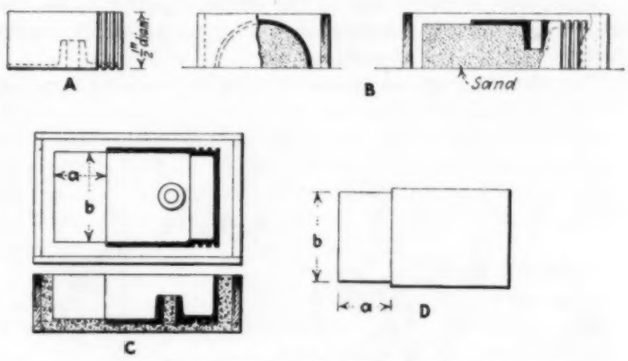
TOOL FOR REBABBITTING FORD CAPS

Simple Corebox for Gas Engine Piston

BY HENRY H. KNABE

The sketches show a quick and easy way to make a corebox for a gas-engine piston, a job that often has to be performed in small foundries when new pistons are required for repair purposes.

Saw the old piston apart lengthwise, as shown at *A*, so as to get one exact half of the casting. Make a rectangular frame of wood of suitable dimensions and lay it over the half piston as at *B*. Pack moist sand under the piston, being careful not to fill the pinhole, and allow the sand to project beyond the skirt of the piston to form a print, which must be carefully rounded to conform to the contour of the piston.



COREBOX FOR GAS ENGINE PISTON

Next mix plaster of paris to a proper pouring consistence (not too thin) and fill the box level full. When the plaster has hardened invert the box and scoop out the sand, leaving the piston in place. This forms a corebox *C* in which a core is made from core sand in the regular way.

The pattern is now nothing but a shouldered cylinder of wood as at *D*, with the dimensions *a* and *b* conforming to the corresponding dimensions of the corebox.

Planing Flat Gibs—Discussion

BY EDWARD SCHROEDER

Referring to several articles under the above subject that have appeared in *American Machinist*, the writer would like to say that in the early days of his apprenticeship, he planed quantities of flat gibs.

The gibs, one or more at a setting, were roughed to within $\frac{1}{32}$ in. of finished size. They were held down on the planer by bunters, and pressed against a parallel tongued in one of the T-slots of the planer by setscrews. After the scale had been removed, some of the holding pressure was released and a light cut taken

from one side with a narrow, square-nosed tool. The gib was then released and turned over on the planer table, and if found to be sprung or warped it was gently tapped with a lead hammer to straighten it. If the gib was not out of wind, tissue paper in narrow strips was packed under one corner, or two diagonal corners, and another light cut taken over one side which generally brought that side true. A cut was then taken on the opposite side, bringing it to size and making it ready to be scraped in.

By this method no tapping with a lead hammer is necessary, except after the first roughing cut.

It is most important that packing up the corners be properly done, also that too much pressure is not exerted by the screws at the time of taking the finishing cuts.

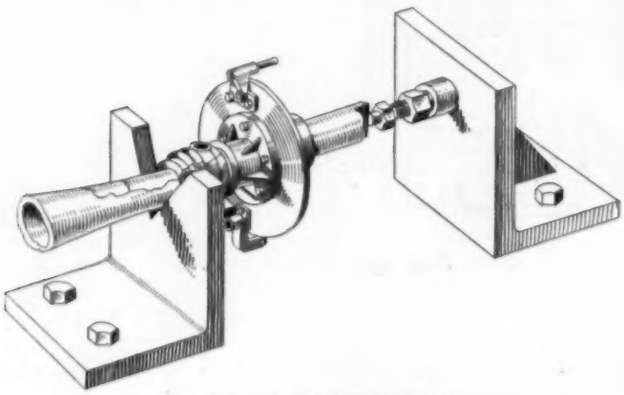
Of course, with a magnetic chuck a quicker job could be done, but we did not have one in the shop when I was planing gibs.

Removing a Cracked Axle Housing

BY DANIEL F. SMITH

The accompanying sketch shows how we pressed a cracked axle housing out of the brake rigging by means of an improvised forcing press, using a small screw jack to apply the pressure.

The shoulder of the brake rigging was placed against



IMPROVISED FORCING PRESS

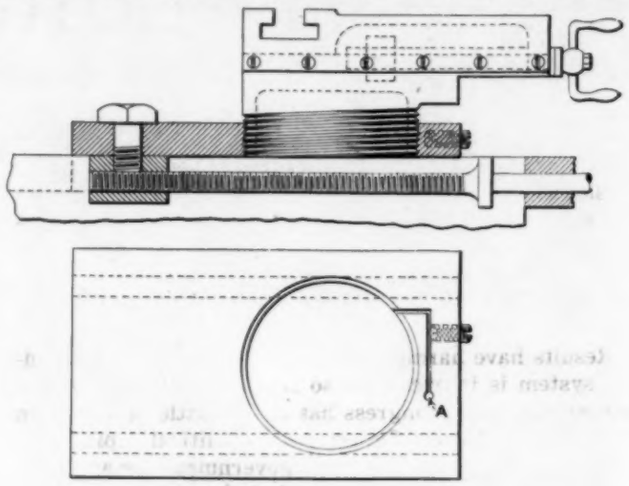
the face of an angle plate, in the top of which was a V-shaped opening, and the jack against the face of an opposed angle plate, both firmly bolted to the table of a large planer. With a short piece of shafting against the end of the housing, and centered over the jack, a pressure of 2,500 lb. was available and by this arrangement the housing was pressed out without injury to any of the parts.

Method of Clamping a Swivel Head

BY J. V. ROMIG

In designing special machinery it is sometimes necessary to provide means of clamping a swivel head in any desired angular position, as the head of a planer or the compound rest of a lathe. For this purpose the writer devised the scheme shown in the cut, which is very easy to apply and will hold the head firmly under any reasonable degree of pressure.

The first job to which I applied it was on the rebuilding of several small lathes that originally had only a plain slide, but which it was desired to fit with compound rests. In this case the cross-slide is bored and threaded with a relatively fine-pinched thread and the bottom of the compound rest is threaded to fit nicely. Then a hole is drilled as at *A*, and a slot is sawed,



CLAMPING SWIVEL HEADS

starting from this hole, to meet a slot that starts from a point on the circumference of the threaded hole. This leaves a weakened section of thread that may be forced against the male thread by the pressure of a setscrew tapped into the end of the slide.

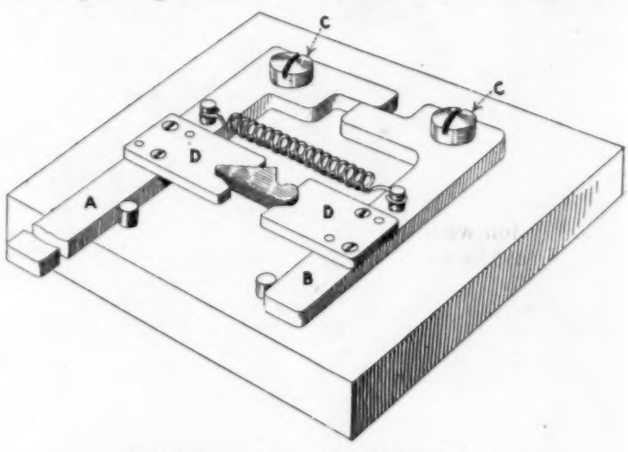
A head so clamped is very firm as it is held in a horizontal position by the threads themselves, while the clamping action of the screw against the weakened section keeps it from turning. This action does not distort the slides, a very valuable feature where accuracy is required.

Convenient Nest for a Shaving Die

BY FRANKLYN SMITH

The writer recently constructed the shaving die shown in the cut, which permitted the nest to be operated by one handle, making it much easier and quicker than the usual two handle nest. This nest can be operated with the left hand and loaded with the right hand.

The handle *A* is pushed back, thereby throwing back the handle *B*, the handles pivoting on screws *C*. The nests *D* are doweled and screwed to handles *A* and *B*. After pushing back handle *A* the work is taken out



NESTING WORK ON SHAVING DIE

and the handle released. The spring brings both handles back against their respective stops, when the device is again ready for loading.

Editorial

More Business in Government

POPULAR interest was immediately awakened by the slogan "More Business in Government." It tickled the public fancy and, as usual, the public sat back and waited for somebody else to put into effect the system that was to reduce taxes, decimate the army of office holders in Washington, eliminate waste and accomplish sundry other highly desirable reforms.

Results have hardly come up to expectations. A budget system is in operation so far as the administration is concerned, but Congress has shown little hesitancy in disregarding budget figures where political capital was at stake. A few clerks from government departments have had to find jobs elsewhere but there are very many still on the job. Perhaps the only way to dispense with their services will be to declare them surplus and turn them over to Col. Smither to dispose of. The reorganization of federal departments and bureaus has failed utterly to materialize.

Who is to blame for the failure of the result crop when such good seed was planted and so much was expected of it? To carry the simile a little farther we might say that it is the fault of the husbandman, the citizen of this big country, who has sat on the doorstep and whittled or gone fishing instead of doing his utmost to insure the production of a good crop of the desired results. Nature has been allowed to take its course unaided and little else than what has happened could have been expected.

What is to be done about it? Just this—the merchant and the manufacturer, the employer and the employee, the capitalist and the laborer have got to get over the idea that politics is a dirty business, defiling to all who get mixed up in it, and step in and make it an honorable venture.

When it comes to politics, distinctions of class or station in life seem to fade out and we all become pretty much alike, too busy or too lazy to take the proper interest in a matter which affects all of us vitally. As a result of this general indifference it has become entirely too simple in this country of ours, for the organized and vociferous minority to put things over on the unorganized, passive, and good-natured majority.

Some of us carry hardly enough weight to make much of an impression in national politics, but the political structure is so made up that none of us is so insignificant that he cannot make himself heard in his local unit.

As a nation we are rapidly approaching a point where politics must be one of the first considerations of every citizen. As a world power we need bigger leaders than we did as a relatively isolated country. Their vision must be broader to take in the viewpoints and peculiarities of men of other nations as well as their own. Their political education must be more complete if they are to lead the rest of us who are not so well versed in its windings.

Until we take pains to select men of this character to represent us in legislative bodies and as executives, we can hardly expect to escape from the blowhards and demagogs who are eager for positions of prominence. Unfortunately, the right kind of public official is not an office seeker. He must be sought out and by the right kind of seekers if he is to make the personal sacrifice usually inseparable from public life.

If you men of the machinery industries are anxious for the kind of political representatives you ought to have, it is up to you to take a hand in selecting and electing them. The results will be just about commensurate with your efforts.

Unions Can Be Sued

THE decision of the United States Supreme Court handed down in the Coronado Coal Co. case last week is generally conceded to be the most important labor decision since the case of the Danbury hatters. Under its terms the liability of labor organizations to be sued is clearly defined.

The leaders of organized labor have always contended that as labor unions were not incorporated they could not be sued, and this decision is consequently a body blow to them. They at least have the consolation, however, that according to the court the central organization cannot be held responsible for unauthorized strikes indulged in by local or district bodies. Their power over these smaller units should be greatly increased thereby.

To the general public, which is not particularly partisan in labor disputes, the decision will appeal as the only one possible in common fairness. Just why labor organizations have been immune from the penalties of breaking certain laws has always been a mystery to us, and the Coronado Coal decision consequently goes far to restore our faith in the fairness of the bench.

Incidentally, hot-headed strike leaders will probably be restrained by cooler counsel when it is realized that damages for which the unions are responsible can be levied against their treasuries.

The Commencers

ABOUT this time every year the colleges and technical schools of the country send forth a flood of ambitious young men who have much to learn and perhaps more to unlearn.

Few of us give the proper significance to the word "Commencement." To most of us it indicates the completion of the young man's period of preparation and he is assumed to be ready to earn a living. A more literal interpretation of the word would really be much nearer the truth, for the great majority of these boys are just ready to commence learning, and their earnings are likely to be small for some time to come.

A word to you hard, practical men who will soon have the job of driving common sense into their heads. It will undoubtedly be a pleasant duty for you to show them how little they know, but remember that it is a terrible drop from the exalted position of a college senior to that of the newest boy in the shop, and you can't expect all of them to land on their feet the first time. Temper justice with mercy.

Shop Equipment News

Elwell-Parker Wheeled-Platform-Trailer

The Elwell-Parker Electric Co. of Cleveland, Ohio, has just placed on the market, to be used with its line of electric elevating platform trucks and tractors, the

ELWELL-PARKER WHEELED-PLATFORM-TRAILER

wheeled-platform-trailer shown in the accompanying illustration. The platform of the trailer is made of corrugated steel plate with deep aprons on each side. This platform rests on 4-in. longitudinal channels which are riveted to malleable castings at the four corners.

In front the trailer is equipped with ball-bearing caster wheels of the swivel type. The fixed rear wheels, on roller bearings, are carried in forged-steel yokes riveted to the top and the side. All bearings are provided with pressure lubrication. The caster wheels are 10 in. and the fixed wheels are 15 in. in diameter. The trailer can also be provided with end or side standards and with a coupler. If desired, it may be equipped with four casters, instead of two casters and two fixed wheels. Where required the wheels may be fitted with 10- and 15-in. solid rubber tires.

For use with electric lift trucks, the trailer has been provided with clearance between the wheels sufficient to permit the lift truck being driven beneath the platform. When the lift truck elevates, the load is supported by the two longitudinal channels under the platform. When used as a trailer, the unit is fitted with hook and eye couplers, or chain couplers.

The unit weighs 600 lb. and has a capacity of 6,000 lb. It is especially adapted for transporting materials in shops and warehouses, and at railway and steamship terminals.

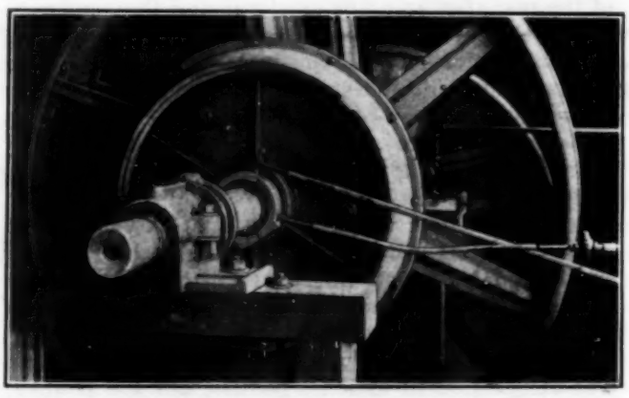
Dickson Pneumatic Clutch

The Rogers Foundry and Manufacturing Co., 11th and Pearl Sts., Joplin, Mo., has just placed on the market the pneumatically operated clutch shown in the accompanying illustration.

The clutch consists of two disks with cork-covered conical faces on their periphery. These disks are closely fitted on a hub and are driven by pins through a triangular plate which is a part of the hub. An air inlet is fitted on the hub in such a manner that the air can be fed through the hub between the disks while the hub is revolving. The two disks are fastened together at the periphery with a flexible, air-tight connection. This arrangement allows the disks to move longitudinally on the hub, although during the slight movement that can occur the flexible connection merely bends and the chamber is kept air tight.

When air under low pressure is admitted between the disks through the air inlet, the disks spread apart. This action forces the conical friction surfaces of the disks into contact with the outer case, which has similar conical faces. This case is carried on the ball-bearing quill. The pins which drive the disks are fitted with springs strong enough to release the clutch and bring the two disks back to normal position when the air pressure is released. Thus, the only effort required of the operator is the movement of a valve.

The clutch is especially adapted to fields where clutches of large horsepower are required, or where it is desired to obtain remote control. Only a small amount of air is required for its operation, from 1 to 3 lb. being ample. One pound of air in a 30-in. clutch gives a spreading power of about 1,400 lb. In places where a gas engine is used for power, the exhaust may be utilized to produce the pressure required for clutch operation. Where electric power is used, a small rotary



DICKSON PNEUMATIC CLUTCH

blower can be driven from the quill to furnish the required air.

Having no toggles or levers, the clutch is not affected by centrifugal force. Since it has two opposed driving cones, there is no end thrust on the bearings. A continuous flow of air is allowed to go into the clutch to take care of any leakage that may occur. As the air inlets are small, breakage is not likely to take place because of too sudden engagement. The horsepower increases rapidly with increase in the diameter of the clutch, the 36-in. clutch, being rated at 165 hp. at 100 r.p.m., and using air at a pressure of 3 lb. per square inch.

Landau Sensitive Multiple Drilling and Tapping Machine

The sensitive multiple-spindle drilling and tapping machine shown in Fig. 1 has recently been placed on the market by the Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y. The machine is of the quick-change type and provides both low and high speeds. By operating the shifting lever, the desired speed can be quickly obtained without jar and while running at full speed. Speeds of 500, 900 and 1,800 r.p.m. are available for drilling. For withdrawing taps, the speeds are 600, 1,000 and 1,800 revolutions per minute.

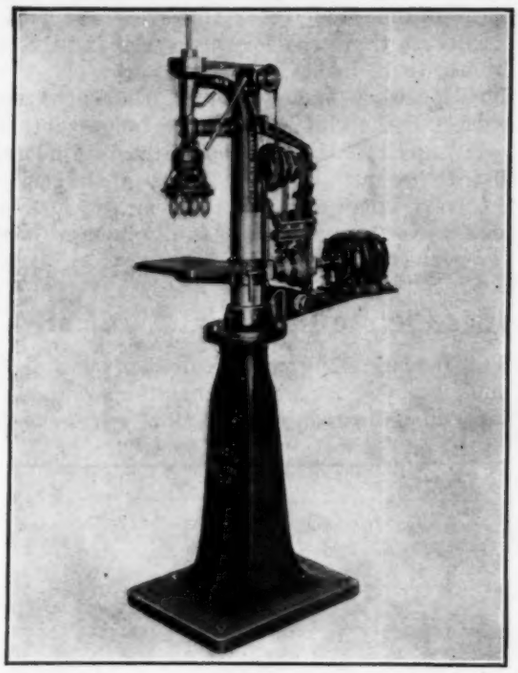


FIG. 1. LANDAU DRILLING AND TAPPING MACHINE

One cone pulley runs in ball bearings on an eccentrically mounted shaft. The slack of the upper belt can be taken up readily by turning this shaft through a portion of a revolution. An idler roller is used to take up the slack of the lower belt when the speed is changed, and it also automatically exerts the proper amount of tension at all loads. The machine can be driven by means of either tight and loose pulleys or a ½-hp. motor. A view of the multiple-spindle head is shown in Fig. 2 The drilling capacity is up to ¼ in., and the tapping capacity No. 10 x 32. The maximum spread of the spindles is 4½ in., and the minmum center distance is ⅞ in. Each spindle can be instantly converted to drilling or tapping without adding or removing any parts. When through drilling, it is only necessary to remove the drill, insert the tap and release a setscrew, and the machine is ready for tapping. Each spindle is a complete unit and may be used individually with the remaining spindles idle. All spindles may, of course, be operated together for multiple drilling or tapping.

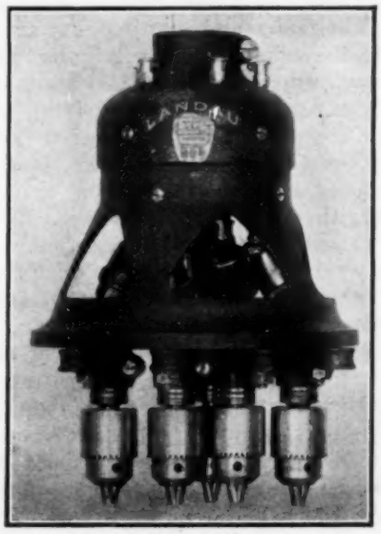


FIG. 2. LANDAU MULTIPLE-SPINDLE HEAD

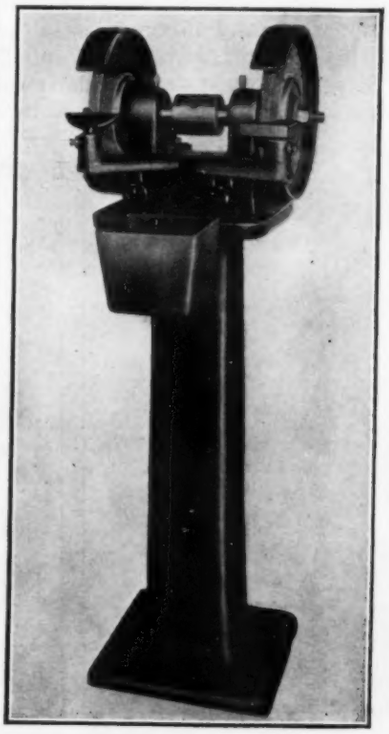
The main drive spindle is centrally located and mounted on ball bearings, which carry the load of the entire head. Each spindle is equipped with upper and lower radial and thrust bearings, and is fully and readily adjustable both radially and vertically. It is but a moment's work to adjust for the shortness of a drill or tap in case of breakage. The spindle arms have triple the strength required to drive the drilling spindles.

The light weight of only 8 lb. makes the head suitable for small work. All operating parts are made of nickel-steel, hardened and ground. The moving mechanism is protected by a ventilated hood which acts as a guard. The feed of the head is operated by means of a rack and pinion, counterbalanced so as to be very sensitive. The head has a travel of 3½ inches.

The table is 10 x 12 in. in size and has a vertical travel of 9 in. The distance from the center of the spindle to the column is 8 in. The height of the machine is 60 in. with the column and 30 in. without it. The floor space required by the motor-driven machine is 20 x 34 in. and by the belt-driven machine 20 x 26 in., the weights being 360 and 300 lb., respectively. It is stated that the machine can produce in eight hours 8,000 holes in a cast-iron plate ½-in. thick.

Fafnir Ball-Bearing Tool Grinder

A ball-bearing tool grinder is a recent development of the Fafnir Bearing Co. of New Britain, Conn. It may be furnished with a bracket to provide the necessary offset where it is desired to bolt the grinder to a post. When it is desired to mount it on a bench, a plate can be provided; or it may be furnished with a pedestal, as shown in the illustration. The chief feature of the grinder is in the method of mounting the spindle, this being accomplished by the use of Fafnir ball bearings. The spindle can be driven by belt direct from the lineshaft, so that it is not necessary to start and stop it each time the grinder is used. Adjustable toolrests, water pot and wheel guards are furnished.



FAFNIR TOOL GRINDER

Landau Plain and Back-Geared Tapping Chucks

The Landau Machine and Drill Press Co., 45 West 18th St., New York, N. Y., has recently placed on the market a line of tapping chucks. At the left of Fig. 1 is shown a simple friction device for holding taps, so as to prevent breakage in case a hard spot is encountered in the work. The device, designated as the Model G, can be used with the Models B and E tapping chucks that will be described later, as well as with standard tapping machines. It is made in two styles, the one shown having a tapered shank, for use on drilling machines and lathes. The other style has a straight shank with a reversing sleeve, so that the device can be used in a turret head.

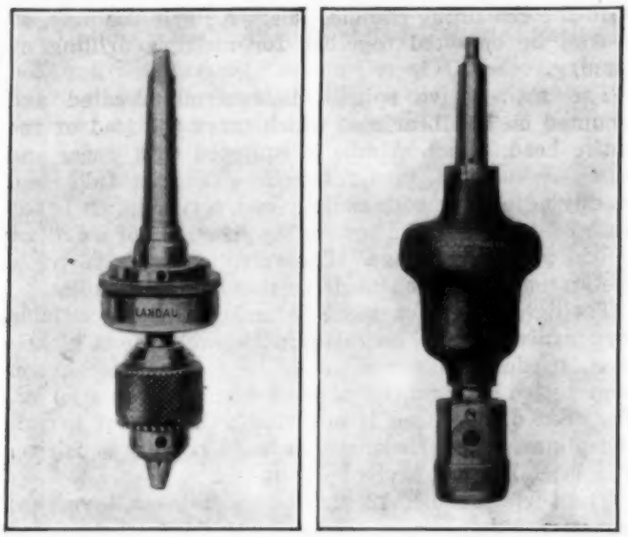


FIG. 1—LANDAU MODEL G (AT LEFT) AND MODEL B (AT RIGHT) TAPPING CHUCKS

At the right of Fig. 1 is shown a single-spindle tapping chuck that can be driven directly from the main spindle of a drilling machine. The device is fitted with ball bearings, and the spindle reverses at higher speed than when feeding downward. The capacity of this Model B chuck is up to ¾ inch.

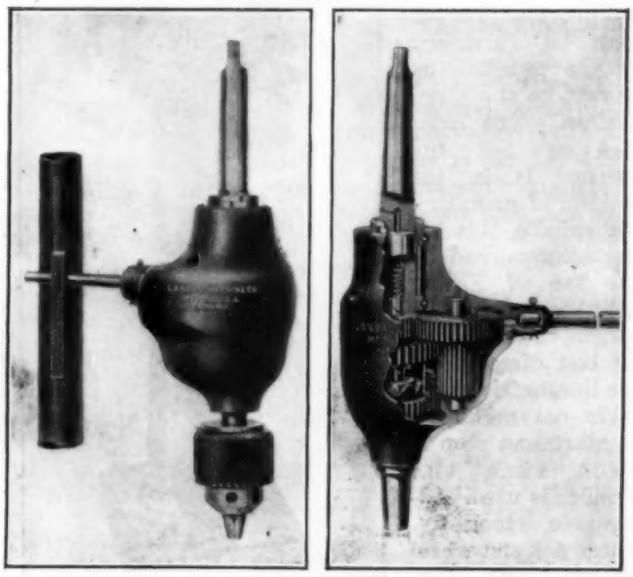


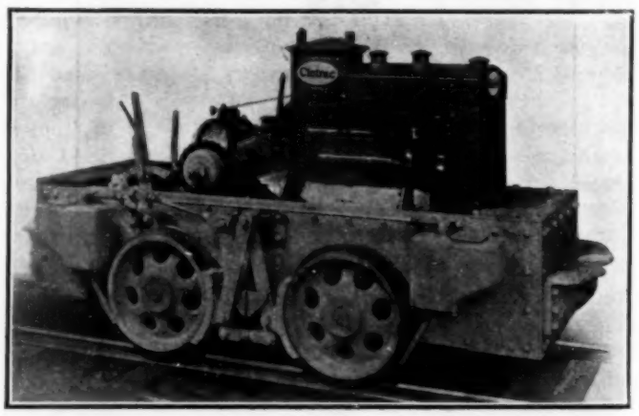
FIG. 2—LANDAU MODEL E BACK-GEARED TAPPING CHUCK

A single-spindle back-geared tapping chuck, known as the Model E, is shown in both external and internal views in Fig. 2. The use of back gears permits of a much higher speed for reversal of the tap than for the forward speed. The arrangement of the clutches can be easily seen. The main drive is fitted with ball bearings, and a standard tap-holding chuck is used. The ratio of the reverse speed to the forward speed is 5 to 1. The chuck holds Nos. 1 and 2 Morse tapers, and it has a capacity up to ⅞-in. taps. The Model F chuck is similar to the Model E. However, the speed of reversal is three times the forward speed and the capacity is from ⅜ to 1⅛ inches.

In the Models E and F chucks, the speed control mechanism and the clutches operate to prevent breakage of the taps in case the movement is hindered by some obstruction in the work. The use of the back gears permits a very small size for the body or housing of the chuck. No screws protrude from the housing, which is perfectly smooth in contour.

Atlas-Cletrac Industrial Locomotive

A light industrial locomotive driven by a gasoline motor and intended for general hauling around industrial plants and for road construction, is shown in the accompanying illustration. It has recently been placed on the market by the Atlas Car & Manufacturing Co. of Cleveland, Ohio.



ATLAS-CLETRAC INDUSTRIAL LOCOMOTIVE

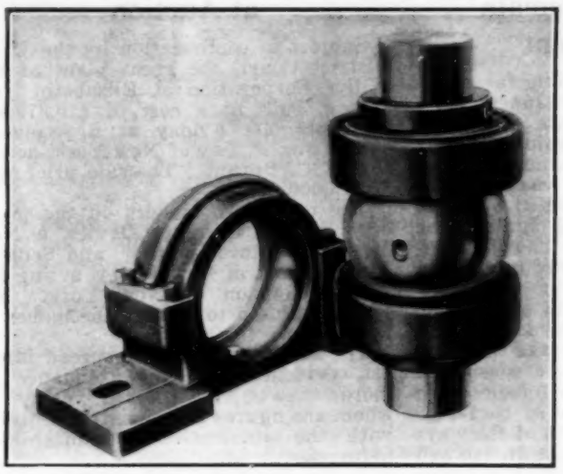
The frame and running gear are similar to those used on the company's electric locomotives and are very heavily made, so that the unit is capable of withstanding severe service. The driving mechanism consists of the complete power plant of the Model F tractor made by the Cleveland Tractor Co. of Cleveland, Ohio.

The 18-hp. motor has four cylinders, and can be run on either gasoline or kerosene. The operating parts are inclosed to give protection, but are readily accessible. A washing device removes dust from the air fed to the motor. The clutch is located in the flywheel of the motor. Both axles are driven from the jackshaft by means of roller chains. Reversal is accomplished by means of a jaw clutch and speed control by the throttle.

Either steel or cast-iron wheels can be furnished. Bumpers, sanders and hand-operated brakes are provided. A cab inclosing the mechanism and the operator can be mounted on the frame. The wheel base is 34 in. and the gage 24 in. or wider. The maximum speed is 8 miles per hour, and the draw-bar pull at 4.8 miles per hour is 800 lb. The tractor weighs about 4,000 lb.

Fafnir Double-Ball-Bearing Self-Aligning Pillow Block

The illustration shows a pillow block that has recently been brought out by the Fafnir Bearing Co. of New Britain, Conn. The essential features of the Fafnir double-ball-bearing hanger box have been adapted to a self-aligning pillow block. The block is



FAFNIR SEL-F-ALIGNING PILLOW BLOCK

nearly frictionless, since both radial and end-thrust loads are carried by the balls. The block has the minimum distance possible from the base to the shaft center. Although it automatically aligns to compensate for any discrepancy between the bed on which it rests and the position of the shaft, the aligning occurs without affecting the ball bearings, as they are both installed in a box which aligns as a unit.

Each unit contains two Fafnir transmission ball bearings having radial ball contact and deeply grooved races. The inner ring of the bearing is made very wide, in order to give the bearing a firm seat on the shaft and to afford greater support to the shaft. The outer ring of each bearing is mounted against a shoulder near the end of the box. An end cap, held in place by a steel wire which is snapped into a groove machined in the housing, contains a felt washer and prevents the escape of lubricant or the entrance of dirt.

The box contains no bolts, screws nor adjustments. It is secured endwise on the shaft by means of two collars fitted with setscrews. These collars have lugs which engage corresponding slots cut in the wide inner rings of the ball bearing. Consequently, the shaft, collars and inner rings revolve integrally, and the collars drive the inner rings so that they cannot slip and score the shaft.

The pillow block may be easily installed. The base may be bolted to the bed, and the cap secured after the box and the shaft have been fitted in place. When dismounting, the shaft and box may be removed without disturbing the base, or the shaft may be withdrawn merely by loosening the driving collars. The oil cannot leak out of the housing.

The spherical seat in the pillow block and the ball on the box permit the whole box to align as a unit with the shaft. The block is of especial use on large sizes of fans and blowers.

High Production Costs—Discussion

By H. L. Wheeler

In his article entitled "Labor Cost in Building Machine Tools," published on page 438 of American Machinist, Simeon Williams, in taking exception to statements made by Harry Senior on page 305 of the same journal, resorts to vague and somewhat inconsistent explanations that do not explain, in a manner that constitutes rather an approval of Mr. Senior's article than otherwise. The statements above mentioned seem to Mr. Williams to be so at variance with the facts as to require confirmation by first-hand witnesses before he can accept them, yet he would have us believe in refutation of them, statements that are equally vague and that have no more definite backing than those of his opponent.

In a report recently issued by the Committee on Elimination of Waste in Industry, of which Herbert Hoover is chairman, it is stated that the average metal working plant in six representative classes actually engaged in the construction and repair of machinery is about 30 per cent behind the best plant (we may assume the Ford plant) in output per employee. According to this report this class of plants must answer for 28.66 points of waste distributed as follows: Management 23.23; labor 2.55; and outside contracts, which, I presume, includes selling expense, 2.88. It would appear from these figures that management is responsible for 81 per cent of the losses due to nonproduction, labor 9 per cent, and outside contacts 10 per cent.

In comparison with other industries surveyed the metal trades make a very good showing in regard to points of waste as may be seen by the following figures indicating points of waste for the others: Boots and shoes, 40.93; textiles, 49.20; building, 53,00; printing, 57.61; men's clothing, 63.78. On the other hand all these industries make a better showing when it comes to management, their losses in this respect being much less than is found in the metal trades. In any event the report is an indictment of management and many so-called systems of scientific management, and it does not seem to substantiate the statement that "labor costs are the controlling element in every thing we buy."

High rents are often made so by people who want to put on a "front" and trade on credit. High costs of food are often caused by stock jobbers, who regulate the supply but not the demand. In any large city tons of food are allowed to rot in storage rather than place it on the market below a "price."

Labor, it is true, is responsible for many of our present-day embarrassments but I do not think it is by any means the largest item. Labor is not a tangible asset. The manufacturer does not have to invest in labor, so that when labor is idle it does not take anything out of plant investment in the way of interest. Labor saving machines and devices are unquestionably good things if they can be kept going, but when they are idle over prolonged periods they are like a millstone about the neck, or the horse that has to eat whether he works or not. A hundred thousand dollars worth of labor saving machinery lying idle will push a man off Easy Street about as quickly as anything I know of.

News Section

War Department Expenses Cut by Senate

The further manufacture of rifles for the army was opposed by Senator Hitchcock of Nebraska, during debate on the War Department appropriation bill. He took the position that further manufacture of the arm was unnecessary in view of the fact that there are already 2,800,000 rifles on hand. He offered an amendment reducing the appropriation for the manufacture of rifles from $375,000 as proposed by the committee to $75,000, which he said would permit the Springfield, Mass., arsenal, which manufactures the arm, to remain in a stand-by condition. Senator Wadsworth of New York, chairman of the military committee, explained that the committee recommendation covered a minimum production of thirty rifles a day at an expenditure of $900 a day, and that it was desired by this minimum production to preserve the art of making rifles which would be otherwise lost. Senator Hitchcock argued that if the Government would continue to manufacture rifles to continue an art there was sufficient reason for continuing the manufacture of chemicals for chemical warfare, and other implements of war. He denied that the art of making rifles would be lost if production was now stopped. Senator Lodge, Mass., opposed curtailment of the appropriation. The Hitchcock amendment was defeated by a vote of 18 to 47.

Appropriations for the ordnance service of the Army are cut by $1,102,060 from allowances made by the House, by the Senate appropriations committee in reporting the War Department appropriation bill. The appropriations for various purposes are reduced by the following amounts: Ordnance stores, ammunition $258,500; manufacture of arms, $25,000; purchase, manufacture and test of tanks, $100,000; mountain, field and siege cannon, $250,000; ammunition for mountain cannon, $100,000; amunition for subcaliber guns, $10,000; repairs of arsenals, $205,000; civilian ordnance schools, $17,000; seacoast cannon, $50,000; ammunition for seacoast cannon, $50,000; ammunition for subcaliber guns for seacoast defense, $10,000; seacoast cannon insular possessions, $25,000.

Further Work on Screw Threads

Screw thread matters will be considered at three meetings which are being planned for the end of June. The exact date has not been set at the time of this writing. One of the meetings will be that of the National Screw Thread Commission. The sectional committee on general engineering work plans to meet immediately following the meeting of the Commission. The sectional committee on standardization and unification of screw threads also expects to meet at about the same time.

Tariff on Machine Tools Probably to Remain at 15 per Cent

In considering tariff rates for printing presses, the senate on June 8 voted to retain the present rate of 15 per cent ad valorem, foreign valuation plan, rather than adopt the committee rate of 35 per cent. The vote was close, the committee rate being rejected by 28 to 27. The argument used against the rate of 35 per cent was that importations of printing presses are insufficient to justify it.

Machine tools and parts of machine tools, being covered in the same paragraph of the tax bill, will take the same rate. The decision must be considered in detail, after the Senate finishes with the bill, by the committee of conferees composed of three members of the ways and means committee of the House and three members of the finance committee of the Senate. Congress must after that approve the committee agreements. The probabilities are that the 15 per cent rate will stand unless machine tool manufacturers are willing to protest and able to show that importation of machine tools is, or is likely to be, heavy enough to justify a higher rate.

Cash registers, now on the free list, were made dutiable at 25 per cent ad valorem foreign valuation plan. Rates were provided of 25 per cent for cream separators, 50 per cent for knitting, braiding and insulating machines and all other textile machinery, 30 per cent on embroidery machines, including shuttles for sewing and embroidery machines, lace making machines, and machines for making lace curtains, nets and netting.

Belgian Industries Favor Standards

Great progress in standardization, particularly in the construction, metal, mining and electrical industries of Belgium are indicated in a report from the Association Belge de Standardization, which has just been received by the American Engineering Standards Committee. The report shows, among other things, that the Belgian manufacturers have established standards in the following lines: Steel fabrication, steel bridges, shafts and pulleys, bolts and rivets, electrical machinery, and galvanized and corrugated iron and partitions. These standards have all been printed, and copies are available through the American committee. Steps are now being taken in Belgium for establishing standards of rules for the design and inspection of reinforced concrete structures, chains, wire cables for cranes, hoists, elevators and mining purposes. A technical committee is now arranging work to be taken up to establish standards on cast-iron pipes and fittings, and rules for the design of shafting.

Durant Buys Willys Property at Auction

Subject to confirmation by the U. S. District Court, the great plant of the Willys Corporation at Elizabeth, New Jersey, built at a cost of $10,379,416 was sold last Friday at a receivers' sale to Jos. P. Day of New York, acting for W. C. Durant. The sale price was $5,525,000.

The other two bidders on the property were J. Clarence Davies, a New York real estate operator, and Senator James Smith, of New Jersey, acting for Arthur Golston of New York. Mr. Davies refused to divulge the names of his clients.

The sale created a wide-spread interest, evidenced by an attendance of more than 1,000 persons, many of whom are figures prominently identified with the automotive and machinery industries.

Under the terms and conditions governing the sale, laid down by the court, the entire property was divided into four chief subdivisions or parcels. The machine tools and machinery covered in a special catalog, made up a fifth division and these were divided into twenty-three separate lots. These parcels were first offered for sale separately before offering the entire property as a complete unit. Under the terms, announced at the opening of the sale, the total of the individual bids had to exceed the bid for the property as a complete unit, otherwise the individual bids were to be rejected and any deposit already made was to be returned.

The bids on the twenty-three lots of machinery and machine tools aggregated $231,650. On offering the twenty-three lots as a complete unit, the machinery was finally sold to Jos. P. Day, for Mr. Durant, for the sum of $375,000. This brought the total individual bids for the four parcels and the machinery up to $3,030,000 and it was at this figure that the spirited bidding started for the property as a whole.

J. Clarence Davies bidding against Senator Smith with an occasional bid from Mr. Day carried the price to $5,000,000, at which point he retired, and the property was sold finally to Mr. Day for the price already stated.

Mr. Durant, promising a complete announcement of his plans upon confirmation of the sale by the court, stated that the plant would be used to produce the new Star car at the rate of about 500 a day.

British Auto Exports Drop One-Half

Exports of British made motor vehicles and parts during the first three months of 1922 show a decrease of more than 50 per cent, as compared with the exports during the same period of last year, and about 30 per cent as compared with the same period for 1920.

American Foundrymen's Association Discusses Technical Subjects

The best attended and most successful convention yet held by the American Foundrymen's Association took place from June 5 to 9 at the Exposition Park in Rochester, N. Y. The meeting was held in conjunction with the Institute of Metals Division of the American Institute of Mining Engineers.

Technical sessions and entertainment features took place each day, and an exhibit of equipment and supplies was carried on during the entire convention. Over 175 concerns representing all branches of the industry exhibited products, and the completeness of the exposition contributed greatly to the success of the meeting. Since foundry appliances of all sizes and types were exhibited, the industry showed the trend of development in foundry practice and equipment.

After registration on the first day, a joint session of the two societies was held. On Tuesday morning a number of papers on metallography were presented at a session held by the Institute of Metals Division.

One of the high spots of the convention was the International Session that also took place on Tuesday morning. According to an arrangement recently entered into with three European associations of foundrymen, exchange papers were presented by J. Leonard, president of the Association Technique de Fonderie de Liege of Belgium, by the Association Technique de Fonderie de France and by F. J. Cook of the Institution of British Foundrymen. Great interest was shown in the papers, particularly the last one on "American vs. British Cast Iron." It was evident that the exchanging of ideas between the various associations greatly promotes interest in the work done abroad and fosters friendship and co-operation.

On Tuesday afternoon simultaneous sessions were conducted on steel and on non-ferrous metals. Separate sessions on steel, gray iron and aluminum were held simultaneously on Wednesday morning, while in the afternoon the meetings were devoted to discussing practice in the brass foundry and the problems of industrial relations. At the latter session a report was made by a special committee on Safety, Sanitation and Fire Prevention. Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, spoke on "Cycles of Depression and Their Prevention." L. W. Wallace, executive secretary of the Federated American Engineering Societies, discussed the "Prevention of Waste in Industry."

At the banquet on Wednesday evening, held at the Powers Hotel, Governor Henry J. Allen, of Kansas, was the main speaker. The governor delivered his usual spirited address on industrial relations.

Research work on molding sand was reviewed on Thursday. The meeting was particularly important because a report on molding sand research was presented by the joint committee of the American Foundrymen's Association and the National Research Council. On Friday, the last day, the time was devoted to a malleable iron session and a general business session.

Federal Commission Hits Steel Merger

Following the request expressed in Resolution No. 286 agreed on May 12 by the United States Senate, the Federal Trade Commission has formulated a report which has been forwarded to the President. The resolution requested that the commission, and also the Attorney-General, inform the Senate what steps have been taken, or were proposed, to ascertain the purpose and probable effects of the proposed merger of certain steel companies which were named in the resolution. The commission was also asked to state the results of any investigation which it may have conducted and what action it has instituted to protect the public interest.

The matter in question was the proposed merger of several of the more important steel companies of the country, a matter which has been given wide publicity in the daily press during the past month. Regarding the proposed combination of the Bethlehem Steel Corporation and its subsidiaries with the Lackawanna Steel Company and its subsidiaries, the commission reported as follows: "That the proposed Bethlehem-Lackawanna merger when consummated would constitute an unfair method of competition in that it contains a dangerous tendency unduly to injure competition and to restrain trade and commerce and that a proceeding by the commission in this respect is in the public interest." In accordance with this finding the commission on June 3 filed a complaint against the merger.

As regards the merger of the Midvale Steel and Ordnance Co., the Republic Iron and Steel Co. and the Inland Steel Co., these companies proposing to form a new corporation to be shown as the North American Steel Co., the commission reported that the plans for this merger have not progressed far enough for the commission to determine whether the combination would be a direct violation of laws governing the restraint of trade or interstate commerce. The details of this plan are, however, being carefully followed and as soon as the commission is in possession of sufficient information, it will make a further report to the senate.

Hundred Million Business in 1921

The sales of the Westinghouse Electric and Manufacturing Co. during 1921 amounted to almost $100,000,000, as shown by the annual report of the company dated March 31, 1922. This is the largest volume of business handled by this company, except during the three abnormally active years before the war. Manufacturing costs were higher, however, as these could not be reduced as rapidly as prices fell. Furthermore, the expense of development work and about one and a half million dollars for depreciation of inventory were charged against manufacturing costs, so that the increase in surplus was only slightly greater than the amount paid out in dividends. The report states that the current assets of the company are $41,700,000, while its current liabilities are only $11,400,000. In addition, the company shows an inventory of $55,000,000.

Cleveland Drill Co. Scores High Tariff on Raw Materials

In a recent debate on the tariff question before the Tariff Committee, Senator Fletcher called the attention of that body to two letters pertaining to steel duty, and, at his request, they were printed as part of the records of the debate. One of the letters, coming from the Cleveland Twist Drill Co., of Cleveland, Ohio, declared that the economic unsoundness of a high raw-material duty versus a low finished-product duty should be pointed out to those who will be responsible for safeguarding the livlihood of American workmen in the basic and highly technical industry of tool production. The letter presented a comparison of American wage rates and tariff rates with those of foreign countries, and endeavored to show the detrimental effect a high raw-material duty will have on the production of American steel tools. The letter declares that the high-speed steel manufacturing interests will undoubtedly take advantage of the high duty on their products to raise the price of high-speed steel to their customers. Foreign small tools similar to those manufactured by the Cleveland company will pay a duty that will be less than two-thirds of the duty on the raw steel itself.

These tools, which can be made in Germany and England by labor receiving a lower scale of wages than American labor, lets them enjoy a double advantage over American made tools. A tariff which places higher duty on tungsten and tungsten steel than on finished tools containing tungsten will injure the producers of these products, as well as the industries which use materials containing tungsten. The low-priced tools as sold in the American market will deprive American steel makers of just that much of their market for the steel which they manufacture.

Another letter from the Poldi Steel Corporation of America protests vigorously against what is called the destruction of our business, particularly in view of the fact that our Government will not benefit from the standpoint of revenue, but, indeed, will lose the substantial revenue now obtaining. The letter declares that with the passage of the bill with respect to the tariff on fine steel, a substantial revenue now accruing to the Government will be cut off.

During the course of the debate, Senator Underwood remarked that the rates, even as reduced by the Tariff Committee, are still higher than those in the existing law. He said that there is no justification for a higher rate, and that an amendment providing for a reduction will be presented at the proper time.

What to Make in Prisons

The House has passed a resolution for an investigation and report by next December by three members each of the House and Senate Judiciary Committees, of articles desirable to be manufactured by prisoners at U. S. penitentiaries at Leavenworth, Kans., and McNeil Island, Wash., including an estimate of the cost of machinery necessary therefor.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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The continued strength of sterling exchange, which carried bills on London to 4.51¼ last Tuesday was the most important development of last week in its bearing on international affairs. It brings the vast British Empire appreciably nearer specie payment and the financial stability that is essential to the normal development of the world's trade. It is due partly to government buying in preparation for the £25,000,000 interest payment which Great Britain will make this fall on her debt to the United States Government, but it also connotes English confidence in the ultimate arrangement of a loan to Germany which was disappointed because of the unwillingness of France to agree to the reduction in the reparation payments to be made her as stipulated by the bankers.

Although it is believed that the logic of events as reflected in Europe's need of credit will in time reopen the *impasse* thus created, the immediate effect has been a further depreciation of the German mark to 33⅜ cents a hundred. The decline was perhaps accelerated by the German Bank statement of May 31 which shows that 151,949,179,000 paper marks were then outstanding as compared with 142,903,593,000 on May 15.

Deflation or Debacle

In some quarters it was inferred from these figures that Germany was afraid to check inflation and would continue to print paper money as long as it would buy anything. But this view is not reasonable. Deflation or a debacle is inevitable in Germany. The former with a loan will be far less ruinous than the latter, and there is no doubt that the less distressing alternative will be accepted, even though France may for a time protest against abating claims no part of which she can collect unless it is made possible for Germany to borrow. The adjournment of the bankers' committee may be in part a strategic move to force France to terms.

It is not therefore unintelligent to expect that marks will advance in value as the facts become understood. Incidentally it is in order to point out that 152 billion marks at 33⅜ cents a hundred are worth considerably less than 143 billion at 38 cents.

The only other important news from abroad is the admission of Lenin's serious illness. It is important because his death or incapacity would probably loosen the grip of the Soviet government in Russia and hasten the complete political reorganization of Europe.

The more significant foreign developments are thus stressed because despite our boasted isolation we are still susceptible to influences which might disturb our foreign trade and it is highly desirable that we should see the facts in their true relation.

Of our domestic situation it is still possible to speak with conservative optimism. Perhaps the most encouraging item of a statistical character published during the week was the news of an increase of 15 per cent over last year in the postal receipts during May. Now that the carriage of parcels is such an important part of the post office business the revenue derived from it is a particularly good reflex of general conditions.

Considered in detail there are only two dark spots in the economic map of the country. One is the coal strike. The other is the low price of wheat. They are both important though the fact that they are so lightly considered attests the widespread and confident cheerfulness of the nation. It is true that a dollar for wheat used to be regarded as a fair price, but that figure is out of line with the present wage scale and the value of most other staple commodities. As to the coal strike Mr. Hoover is still laboring with it but an agreement between the miners and the operators seems no nearer and if after the first of July the mines are still idle there will be genuine reason for concern.

Railroad earnings and traffic are surprisingly good. The Labor Board has decreed another reduction, estimated at $60,000,000 annually, in the pay of the shopmen, and another strike vote is being taken, but good judges say the men will accept the cut and this seems probable. The New England textile strike is approaching its end. The mill owners have won and operators are slowly returning to work but with bitterness in their hearts that bodes ill for the future of the cotton industry in the North. The dry goods trade continues to improve. It might now be called excellent.

Commodity Markets Firm

The cotton market goes up and down as the rain falls or the sun shines. An accurate weather prophet could make a fortune as prices fluctuate between 20 and 21 cents, which will probably be the range until public opinion in regard to the size of the crop has crystallized.

A sharp advance in sugar has justified the views previously expressed in this letter. Refined has been advanced to six cents and Cuban raw has sold at three cents cost and freight, ex duty. If refined should go to seven cents, as seems possible, the raw parity would be about four cents. These figures are not by any means improbable in view of the enormous demand, the reduction in the European production of beet sugar and the rapid distribution of a supply that was considered burdensome only four months ago.

The steel mills are busier. Iron is up. Building continues active notwithstanding the increased cost of brick and lumber. Silk is firm. Rubber is unchanged. The automobile manufacturers say that they will be running at capacity through July, and May production was the largest in our history. Copper hesitates around fourteen cents but at this figure it is moving freely. The stock market is erratic but in the main firm, though prices are not much higher. The steel mergers are held up pending an investigation by the Federal Trade Commission whose ultimate approval is expected upon the theory that the present administration is not unsympathetic with big business. Several new bond issues, including one of $6,000,000 for the city of Montevideo in Uruguay, and another of $7,500,000 for the city of Greater Prague, now the capital of Czecho-Slovakia, were successfully disposed of.

The constant absorption of these foreign obligations and the advance in sterling must in time lead to the loss of some of our gold. This we can well afford for we have too much, but when the outward movement commences the markets will be sensitive to its continuance and the weekly statement of the Federal Reserve System should therefore be closely watched. The figures published last Friday morning show a decline in the reserve ratio from 78.0 to 77.6 per cent, an expansion of $2,500,000 in the gold reserve, and an increase of $40,000,000 in member banks' deposits.

These changes are not significant and there is nothing in the outlook that gives cause for uneasiness or reason to doubt that we shall have fair weather and a high barometer at least until after the election.

Safety Institute Reinstates Seaman Medal for Health Service

The Safety Institute of America has announced that the Louis Livingston Seaman gold medal is to be awarded this year for progress and achievement in the promotion of hygiene and in the mitigation of occupational disease. This medal was first given in 1911, but for the last three years war conditions have prevented the Institute from making the award. Former Surgeon-General Gorgas received the Seaman Medal in 1914 in recognition of his winning fight against the disease-carrying mosquito in Panama. Other recipients have been Dr. Alva H. Doty, former Health Commissioner of the Port of New York for efficient work in protecting the city from foreign invasions of disease; the United States Steel Corporation and the National Cash Register Co. for their pioneer work in the field of employee welfare; William A. Fairburn for the protection of workers in the match industry against phosphorous poisoning; and to the Julius King Optical Co., of New York, for scientific research and practical achievement in overcoming the harmful effects of light to the eyes of arc welders. The most recent award was to Arthur H. Young, Chief Sanitary Expert for the Federal Government during the World War.

Plans for National Transportation Institute

Organization in the near future of a National Transportation Institute is practically assured. While no date has been set for the organization meeting, it will be held before the end of the summer. Bird M. Robinson, the president of the American Short Line Railroad Association, and his associates, who are doing the active work of promotion, are engaged at present in lining up such support as will insure the new organization of representative backing.

The organization of such a national association is being urged by Representative Sidney Anderson and his associates on the joint commission of agricultural inquiry set up by Congress. Formal action endorsing the Institute already has been taken by the following organizations: American Farm Bureau Federation, National Agricultural Conference, American Lumber Congress, National Association of Manufacturers, Joint Commission on Agricultural Inquiry, and the American Short Line Railroad Association.

The Institute is to have its headquarters in Washington "under the supervision and control of men of pre-eminent ability, standing and learning, with reference to transportation." The organization will attempt to acquaint the public with:

1. The true fundamental principles underlying the various kinds of transportation facilities.
2. The facts as to the present conditions affecting transportation and the relative necessity and important of each class of common carrier.
3. The real effect of each type of legislation and regulation.
4. How and to what extent, the public and the carriers will be benefited, or affected adversely, by any policy or course of action that may be adopted in respect to their transportation problems.

Bosch Branch Managers' Conference

A three-day conference of the branch managers of the American Bosch Magneto Corporation was held on June 1, 2 and 3 at the corporation's plant at Springfield, Mass. The branch managers attending this conference were Charles Shedd, of Detroit; George Shortmeier, of New York; A. K. Chamber, of Chicago, and T. C. Miller, of San Francisco, with their assistants. These men were summoned to confer with the executives of the corporation at Springfield for a discussion of business conditions and plans which should be followed in carrying on the sales and service activities in the field.

A. H. Bartsch, general sales manager, states that the rapidly changing business conditions of the present year do not warrant a fixed and firm sales policy. He believes a more liquid policy is necessary, in order to take full advantage of the changing conditions.

In criticising the spread between the labor cost and duties in the tariff bill Senator Simmons, N. C., said that in the case of electrical machinery, apparatus and supplies, the labor cost is 23.9 per cent while the duties in the bill are 40 per cent.

Bulletin on Prevention of Blindness

The National Committee for the Prevention of Blindness, whose headquarters are in the Russell Sage Foundation Building, New York City, has issued a revised edition of its Bulletin No. 12. This bulletin was originally issued in 1917 and has been out of print since the latter part of 1921. It will combine one complete volume of practically all the available information on the subject of blindness. The committee has been aided in its work of revising the bulletin by the Safety Institute of America, the National Safety Council, the American Society of Safety Engineers and several specialists in this line.

The regulations of the recently developed safety code for the protection of the heads and eyes of industrial workers, adopted by the United States Bureau of Standards and approved by the American Engineering Standards Committee, will be included in this revised bulletin. The publication will be prepared with a view to its distribution among heads of departments of industrial plants, engineering colleges, technical schools and to others interested in the prevention of blindness among industrial workers. It is expected that the bulletin will be ready by the fall.

Business Items

The Dail Steel Products Co., 8751 Grand River Ave., Detroit, Mich., has contracted with the Packard Motor Co., Detroit, for the entire output of its metal-stamping department, and operations will be carried on exclusively for this company for some time to come. Daily shipments will be made by motor truck to the Packard plant.

C. L. Amos, of the C. L. Amos Coal Co., 200 East Genesee St., Syracuse, N. Y., and associates, have formed the Electdrive Co., with capital of $50,000, to manufacture motors, engines and kindred products. Other officials include E. M. Larkin and F. B. Conway, both of Syracuse.

The Fisher Body Corporation, General Motors Building, Detroit, Mich., has acquired the former plant of the Cadillac Motor Car Co., Cass Ave., comprising about 650,000 sq.ft. of floor space. The factory will be used for the manufacture of special automobile bodies, and will give employment to about 2,000 operatives.

The Franklin Automobile Co., Syracuse, N. Y., has awarded prizes to 226 employees for contributions submitted in the second "Suggestion Contest" conducted at the plant. The prizes ranged from three first awards of $400 each, one of $300, three of $200, two of $100, five of $50, and the remainder, $25 each. The prizes were given for: (1) Best suggestions for improvement in the Franklin car; and (2) best suggestions for reducing the cost of production, without in any way impairing the quality of the car.

The Monmouth Plow Factory, Inc., Monmouth, Ill., manufacturer of agricultural machinery, has arranged for a change of company name to the Brown-Lynch-Scott Co.

The Bridgeport Machine Co., Bridgeport, Conn., which recently purchased the plant of the Jones Automobile Co., at Wichita, Kansas, has moved its Bridgeport offices and shop from North Main St. to North Boston St. The plant of the same company at Marietta, Ohio, will also be removed to Wichita as soon as arrangements are completed.

The Firth-Sterling Steel Co., of McKeesport, Pa., has opened a western office at 336 East 3d St., Los Angeles, Calif. This office will be in charge of William E. Nelson, who has been engaged in marketing Firth-Sterling steel for twenty years. Mr. Nelson will be assisted by F. J. Kuhlmann, L. W. Mead, T. D. Moore.

The Pittsburgh Testing Laboratory has opened a sales office, with a complete inspection bureau, at 1864 Railway Exchange Bldg., St. Louis, Mo. Colonel N. C. Hoyles has been appointed district manager. Colonel Hoyles was formerly manager of the Cincinnati branch of the same company.

The Henrici Laundry Machinery Co., Dorchester, Boston, Mass., has recently incorporated the business with a capital stock of $165,000. The incorporators of the company are William P. Everts, 42 Crafts Road, Brookline, Mass.; Thomas W. Morris and Bertha A. McCarthy, Boston, Mass.

The Eastern Shear Co., manufacturer of scissors and shears, New Haven, Conn., recently voted to dissolve the company, and a preliminary certificate of dissolution has been filed with the Secretary of State of Connecticut. All claims are to be sent to L. M. Molloy, Grant street, New Haven.

The Ingersoll-Rand Co. has moved its Dallas, Texas, office from Main St. to the Magnolia Building.

The Atlantic Foundry Co., Akron, Ohio, has announced a decrease in its capital stock from $1,000,000 to $985,-300

The plant of the Sandusky Foundry and Machine Co, Sandusky, Ohio, was recently damaged by fire to the extent of $10,000.

The Lomar Manufacturing Co., Middletown, Ohio, has elected the following officers: C. W. Shartle, Jr., president and general manager; Thomas Randolph, vice-president; L. L. Lomar, general superintendent.

Judge Morton of the United States District Court on June 5, appointed as receivers for the Harley Co., producers of drop forgings and castings in Springfield, Mass., Samuel M. Green, engineer, and George A. Bacon, attorney, both of Springfield. This action followed the petitioning of the concern into bankruptcy. A previous petition for a receivership filed by a stockholder was denied on legal grounds.

The Hendee Manufacturing Co., former owner and now mortgagee of the Harley Co., is restrained by the court from selling the Harley plant by foreclosure, pending an investigation by the receivers. The plant was sold to A. W. Morris and others about six months ago, and the new owners are said to be in default and steps were resorted to for the purpose of preventing foreclosure until a financial dispute between the two companies could be settled. The plant was sold for about $1,000,000 and a mortgage given to the Hendee Co. for $725,000. The receivers furnished bonds of $10,000 each and will enter at once on an investigation of the case.

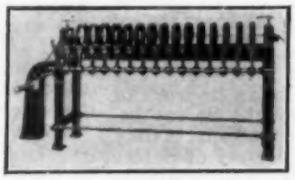
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Filing Machine, Strip-Metal

Duston & Clark Engineering Co., Inc., Cleveland, Ohio

"American Machinist," March 16, 1922



The machine is used for filing the edges of strip metal to special shape and is especially adaptable to cold rolling mills. It is equipped with fifteen pairs of semi-circular heads carrying adjustable files. All the heads at the front can be operated by a lever so as to pull them forward and open the filing space. The strip metal may be of any gage and up to 3 in. in width. The end of the coil of metal on the spindle spool is passed between the two clamps at each end of the table, and then gripped and wound on a power-driven spool. Weight 1,000 pounds.

Platform, Lift-Truck, Steel, "Hallowell"

Standard Pressed Steel Co., Jenkintown, Pa.

"American Machinist," March 16, 1922

The device is made of steel and wood. The runners at each side consist of steel angles, the ends of which are bent outward. The truck slides easily between the runners. The top of the platform is made of wooden planks bolted to the runners. Steel sockets are riveted to the runners for holding the legs, which are wooden blocks inserted in the sockets and bolted in place. Blocks of different lengths can be furnished to suit the type of truck employed.

Hoist, Portable

Manley Manufacturing Co., York, Pa.

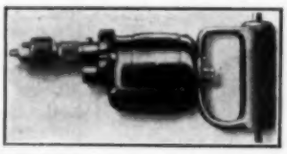
"American Machinist," March 16, 1922

The hoist is primarily for garage use. It has two chains, each operating independently, mounted on sliding drums on the horizontal hexagon shaft at the top of the frame. The shaft is turned by a crank operating through a chain and spur gears. Two speed ratios are provided. The leverage with auxiliary pulleys is 400 to 1, and without them 200 to 1. Capacity, 4,000 lb. Width, 8 ft. Height, 7 ft. 9 in. Weight, 450 lb. A larger size having a capacity of 8,000 lb. is made. Width, 9 ft. Height, 9 ft. Weight, 1,000 pounds.

Drill, Electric, Portable, "Jones"

Consolidated Instrument Co. of America, Inc., New York, N. Y.

"American Machinist," March 16, 1922



The device is used in general light work and has capacity for driving a ¼-in. twist drill. It is equipped with a universal high-speed motor operating on direct or alternating current of 25 to 60 cycles. The gears are made of heat-treated tool steel, and have helical teeth. The spindle carries a No. 1 Jacobs chuck, and its end thrust is taken on ball bearings. Plug and switch are furnished, with 10 ft. of electric cord. Length, 10 in. Weight, 4 pounds.

Press, Armature, No. 0, "Perfection"

Naperville Machine Co., Inc., Naperville, Ill.

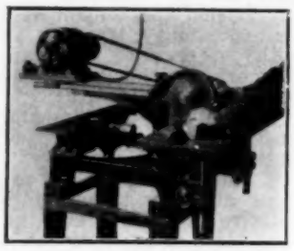
"American Machinist," March 16, 1922

The press is for use chiefly by electrical repair men, but it can be employed also for assembling operations on piston bushings, spindle bushings, gears and similar work. The cast-steel frame can withstand a pressure of 3,000 lb. on the work. A hardened steel plate having three sizes of openings is furnished to accommodate small work. Its two halves can be slipped together underneath the bearings on an armature shaft so that the shaft can be pressed out of the bearing. Height, 17 in. Opening in base, 5 in. in diameter.

Woodworking Machine, Portable, Universal

Hutchinson Manufacturing Co., Norristown, Pa.

"American Machinist," March 16, 1922

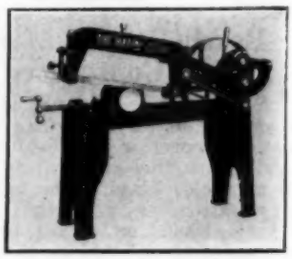


The machine, for mounting on a bench or stand, is adapted to a variety of woodworking operations. It carries an 8-in. crosscut saw, an 8-in. rip saw, jointer, boring and mortising attachments, a miter board that can be set at any angle and other devices. It is operated by a ½-hp. motor driven on either d.c. or a.c. and mounted on a swiveling slide. Speeds: saws, 4,200 r.p.m.; jointer, 4,800 r.p.m. Capacity, hard wood up to 2 in. in thickness. Bench space, 18 x 24 in. Weight, 240 pounds.

Cutting Machine, Metal, High-Speed, Junior

Racine Tool and Machine Co., Racine, Wis.

"American Machinist," March 16, 1922



The saw runs at a speed of from 60 to 100 strokes per minute, with strokes 6 in. in length. Blades of 21-gage steel from 10 to 12 in. long are used. There is a positive mechanical lift on the non-cutting stroke, and the cut is taken on the draw stroke. Pressure is applied to the saw blades by gravity. An automatic knock-out stops the saw when the cut is finished. Capacity, 4 x 4 in.; with adjustment, 6 x 6 in. Height, 20 in. Floor space, 38 x 12 in. Weight, 150 pounds.

Grinder, Bench, Electric, Exhausting

Forbes & Myers, Worcester, Mass.

"American Machinist," March 16, 1922

Outside the bearings of the machine are located centrifugal fans which blow the dust directly back through the exhaust pipe connected at the rear of the grinder. The fan does not have sufficient power to carry the dust through long pipes. The inclosed motor of the induction type is made for single-, two- or three-phase alternating current, and in ½ and ¾-hp. sizes. The wheels are guarded. Adjustable toolrests can be located at both ends.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

CHARLES L. WARNER recently resigned as construction superintendent for the Taft-Pierce Mfg. Co., manufacturer of special machinery, Woonsocket, R. I.

G. C. SHIDLE, formerly Pittsburgh manager of the La Belle Iron Works, of Steubenville, Ohio, has become sales manager of the iron and steel department of the Thomas R. Heyward Co. His offices will be in the Bowman Building, Pittsburgh. Mr. Shidle succeeds William M. Orr.

GEORGE W. SCOTT has joined the sales force of the Sheet Metal Manufacturing Co. at Youngstown, Ohio. He was formerly a division manager of the United Alloy Steel Corporation.

H. B. HINMAN, formerly in the sales department of the Stanley Works, New Britain, Conn., has resigned. He will become superintendent of the Trumbull Steel Co., Warren, Ohio.

WILLIAM H. EAGER has assumed the presidency of the Whitman & Barnes Co., Akron, Ohio. He succeeds A. D. Armitage who resigned to devote his entire time to the business of the J. H. Williams Co. of Brooklyn, N. Y., of which he is president.

E. H. SPRINGFORD, assistant to the president of the Goodyear Tire and Rubber Co., of Akron, Ohio, has resigned that position to become president of the Steel and Tube Co., Chicago.

HENRY W. BALSIGER, of the Yale and Towne Mfg. Co., Stamford, Conn., has been appointed to succeed W. W. Brasier, to take charge of the California sales department of the company, with headquarters in San Francisco. Mr. Balsiger was formerly of the Chicago office of the company.

SYDNEY R. MASON, secretary of the Whitin Machine Works, manufacturer of textile and cotton machinery, etc., Whitinsville, Mass., who has been in Japan and the Orient for the past several months, is expected home about the middle of June. Mr. Mason arrived in San Francisco on June 3rd.

RALPH TEMPLETON, for several years manager of the Whitman & Barnes Manufacturing Company's New York office and store, will assume an important position in the company's executive offices in Akron July 1. Mr. Templeton entered the employ of the Whitman & Barnes organization in 1898 and has served it in various capacities continuously since that time. After serving in the Akron office and as Detroit representative he was appointed manager of the New York store in 1910.

W. E. WHITING, formerly connected with the Heald Machine Co. and with the Norton Company, is now connected with the Greenfield Tap and Die Corporation, Greenfield, Mass. Mr. Whiting will be attached to the Detroit office at 75 Congress St., and will represent the machine tool division of the company, specializing on the "Hydroil" internal grinder recently put on the market by that concern.

MELVILLE D. JOHNSON has been selected president of the Syracuse University branch of the American Society of Mechanical Engineers.

W. F. KENTER, works engineer of the Power Specialty Co., New York, has resigned that position and will take up sales work as an independent.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

A mercantile firm in Spain desires to purchase faucets for water and steam, domestic and irrigation pumps; machinery for the manufacture of designs made from brass, iron, and other metals; casting machines for iron, copper, etc.; and graphite molds for casting metals. Quotations should be given c. i. f. Spanish ports. Reference No. 2354.

Firm in Spain wishes to purchase hardware, iron and steel products and tools of all kinds. Quotations desired, c. i. f. Spanish port. Correspondence, Spanish or French. Reference No. 2370.

Firm in Italy desires to be placed in touch with exporters of iron, metal, machinery, and tools. Reference No. 2374.

An importing firm in Spain wishes to purchase aluminum sheets for automobile bodies and machinery for working said metal, and electric ovens for varnishing and enameling automobiles. Quotations should be given c. i. f. Spanish port. Terms: Cash against documents or letter of credit. Reference No. 2312.

Automobile supply dealers in Norway desire to purchase and secure an agency for the sale of piston rings (lock joint and step joint). Quotations should be given c. i. f. Norwegian port. Payment to be made through banks in Norway and New York. Reference No. 2361.

Book Reviews

World Metric Standardization: An Urgent Issue. Compiled by Aubrey Drury in collaboration with other members of the World Metric Standardization Council. Five hundred thirteen 6 x 9-in. pages, cloth boards. Published by the World Metric Standardization Council, 681 Market St., San Francisco, Calif. Price $5.

Reviewed by
VERNE L. HAVENS
Editor, *Ingeniería Internacional*

The organization known as "World Metric Standardization Council" is purely voluntary and the members are persons who urge the adoption of the metric system in the United States. Many of the more active members of the association frankly desire that the adoption of the system shall be compulsory, and at the earliest possible moment consistent with existing conditions.

The book recently published by this council contains an enormous amount of data and arguments in favor of the use of the metric system. It is rather unfortunate that the council should have announced in the book that all who purchase it are enrolled as sustaining members of the "World Metric Standardization Council," without the necessity of any other payment. It is quite possible that many purchasers of this really valuable book would not care to become members of a distinctly partisan organization.

Various chapters contain reports of many scientific, commercial and independent associations, and individuals, which set forth cogent reasons for the universal adoption of the metric system. One very important chapter treats of the probable cost of change, in and to the United States, from the present system to the metric. To those who already use the metric measure this book will supply a world of proof as to why they should continue to use it. To those whose minds are open on the subject, it will do much to convince them that the metric system is superior to any other. To those whose opinions are fixed by previous study against the metric system it will have little avail. In any event, it is principally for the ones who have not taken a definite position in favor of or against the metric system.

The writer of this review has read much in pro and contra to the English system and the metric system. He has, for more than twenty years, used both systems every day. He looks upon both systems as being mathematical languages in which one can express any mathematical relation for which there may be need. He is quite familiar with the condition which exists in many countries, where mathematical languages have been made obligatory or legal. In those countries where the average of literacy is low, and only a few well educated people dictate the mathematical language to be used, the change from one form of expression to another is comparatively simple. Even so, at least one generation is required to make a perfect change. Where everybody can read and write to some degree, and really think about a great variety of weights and measures, even though it be in a simple way, the change is more difficult.

Mere laws have not driven Magyar, nor Basque, nor Guarani from the minds of the people of Austria, Spain, France and Paraguay. Neither has our own national effort been successful in eliminating the vara or league from land measure in that territory which we acquired from Mexico so long ago.

It is universally admitted that the old arbitrary English system of weights and measures has many faults. Its greatest advantage to the present generation is that the great mass of the people in many countries think in that system. There have been many opportunities to improve the system, but the people do not want their mathematical language changed and it has been changed very little. The metric system is legal in the United States, but very few ever use it. Those few engaged in international or scientific relations translate from one language to another when necessary. It is no criticism of the metric system to say that the present generation of English-speaking people will think in the present system until they are dead. Just why such efforts should be made to try to compel its use at this time is not apparent. The United States is going through one experience of prohibition at this time. It may prove successful after a period of years because it has the good health and morals of the community in its favor, but there is nothing unsanitary about the English system of feet and pounds, no moral turpitude is involved in speaking of a ton of coal in place of 1,000 kilograms.

The book is full of facts, but it is obviously partisan. For example, it is stated that "Those who obstruct the general adoption of the metric system constitute less than one per cent of the voters." It would probably be equally true, or equally false, to say that less than one per cent of the voters favor it. The plain facts of the case are that a very small group urges the compulsory adoption of the metric system and those most directly aected will oppose it. It is a question of very grave doubt if all those who participate in the combined support and opposition of the plan number one per cent of the voters.

It is a tempest in a teapot from one point of view, but very grave from another. Those most directly concerned might induce quick action for or against the compulsory adoption of the metric system by the national congress, and destroy the present satisfactory condition in the United States, where either system is legal and one's personal interests determine which he shall use.

Modern Methods of Welding As Applied to Workshop Practice. By J. H. Davies. 263 pages, illustrated. Published by D. Van Nostrand Co., New York.

This is a rather complete book in so far as the subjects treated cover a wide variety of practice and much attention is given to apparatus of various kinds. Chapter on pre-heating, on the preparation of welds, on handling cast iron, aluminum, brass and other metals, including lead burning, are given.

Various kinds of welding are included, such as oxy-acetylene, oxy-hydrogen, thermit and electric welding of the different tyes. Spot welding, butt welding and other methods are shown in considerable detail. The illustrations are very complete and are a great aid in making the text clear to the reader.

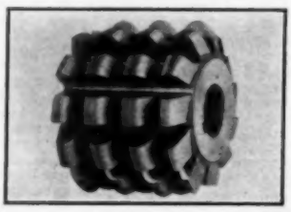
Many examples of welding of different kinds are shown, making clear such defects as slag enclosed in a welded seam. Examples are given of welding in inaccessible places by the use of mirrors. Attention is also given to the protection of the welder by the use of shields and suitable goggles. The descriptions seem to be quite complete and the reader should have no difficulty in following the directions given. Although most of the illustrations are copied from others and are not particularly clear on that account, they serve their purpose in most cases.

While this book is by an English author and naturally gives much attention to British practice, it also devotes considerable space to American methods and American apparatus. The combination should be of value to all users of welding apparatus.

Condensed-Clipping Index of Equipment

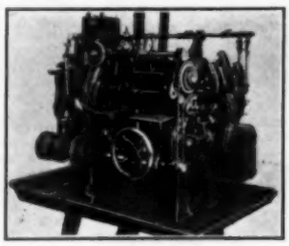
Patented Aug. 20, 1918

Hob, Sprocket Tooth, Universal
Diamond Chain and Manufacturing Co., Indianapolis, Ind.
"American Machinist," March 2, 1922



The hob operates on the principle used when cutting gear teeth, each being capable of cutting sprockets with any number of teeth for a given pitch and roller diameter. It is not limited to a small range of teeth. The teeth cut by the hob conform to the specifications for the new "American standard" tooth form, and the space angle gradually decreases as the number of teeth in the sprocket increases, and the tooth angle gradually increases. The generating action of the hob tends to produce these changes, although not at just the same rate as for the true "American standard" form.

Attachment, Slotting, Automatic Screw Machine
Davenport Machine Tool Co., Rochester, N. Y.
"American Machinist," March 2, 1922



The attachment is used for slotting screws, and consists primarily of a three-hole turret mounted on a bracket, attached to the machine by bolts holding the stationary head caps in place. The saw head mounted over the revolving head uses the same change gears as the machine itself. At each forward movement one screw is picked up, another slotted and a third ejected. With slight modification, the attachment can be used for other second-operation work, such as milling, cross-drilling and burring.

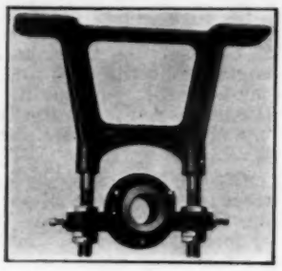
Grinder, Toolpost, Universal, "Elteco"
Liberty Tool Co., Inc., Irvington, N. J.
"American Machinist," March 2, 1922

The base of the device is mounted on the swiveling toolslide of the lathe. The spindle is mounted so that its height can be adjusted, and is provided with one adjustable taper bearing. Different types of wheels and spindle extensions can be used. The machine has a 5½ x 1 in. wheel for cylindrical grinding, a cup wheel for face grinding and two extension arbors for internal grinding. The spindle is driven by a belt connected to a ¼ hp. motor mounted on a slide. Both the longitudinal and transverse feeds are obtained from the lathe slides.

Starter, Induction Motor, "Thermaload"
Monitor Controller Co., Baltimore, Md.
"American Machinist," March 9, 1922

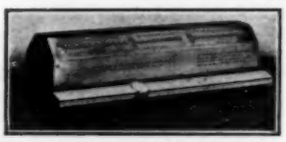
This thermal-limit starting device used with induction motors consists of a three-pole magnetic contactor and a thermal-limit relay, both mounted on a slate panel and inclosed in a metal cabinet. It is adapted to remote control, and operated by means of push buttons. It gives over-load and low-voltage protection, provides for starting at full current, voltage and torque, and automatically prevents overheating the motor. It is available in all sizes up to 3 hp. on 110-volt single-phase current, 5 hp. on either 220-volt single-phase or 110-volt polyphase, and 10 hp. on either 440-volt single-phase or 220-volt polyphase current.

Hanger, Line-Shaft, Ball Bearing
Skayef Ball Bearing Co., 165 Broadway, New York, N. Y.
"American Machinist," March 2, 1922



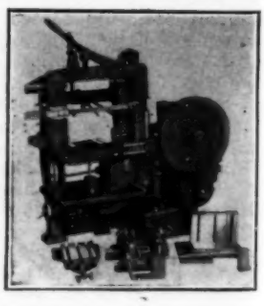
The device has a two-point suspension and carries the bearing in a split housing held by two threaded suspension rods. Vertical or horizontal adjustment can be made at the end of the housing by the locknuts and setscrews. The pressure applied while making adjustments is not transmitted to the bearing. The self-aligning feature of the bearing allows the shaft to turn with a minimum amount of friction, and prevents rubbing, heating and binding.

Calculator, Machine-Time
Simplex Calculator Co., Box 184, York, Pa.
"American Machinist," March 2, 1922



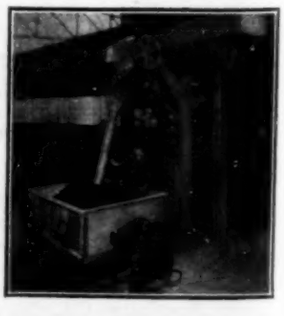
With this calculator the time required for machine-tool operations is computed for either rotating or reciprocating work or tools. For use with rotating work, the cylinder carries tables indicating the r.p.m. for diameters of from ¼ in. to 10 ft. at all ordinary cutting speeds. The range of speeds is shown above the slot on the left-hand end of the case. The slide rule bears four scales for feed, r.p.m., length and time. For reciprocating tool work the cylinder has tables giving the number of square inches planed per minute at forward and return speeds and feeds.

Saw, Shaping, Universal, High-Speed
Peerless Machine Co., Racine, Wis.
"American Machinist," March 9, 1922



The machine has a standard hacksaw blade, but in many features of construction and method of operation resembles a milling machine. The stroke of the machine is 5½ in. The cutting speed is changed by cone gears in a box at the rear, and three speeds of 50, 85 and 132 strokes per minute are provided. The drive is by belt at 600 r.p.m., or by a 1-hp. motor mounted on the rear and running at 1,700 to 1,800 r.p.m. Feed is adjusted by the small handwheel in the front. The machine is equipped with a vise, angle fixture and a cross-feed fixture. Height, 23 in. Floor space, 24 x 43 in. Weight, 750 pounds.

Filling Machine, Flask, Stationary or Portable
Osborn Manufacturing Co., 5401 Hamilton Ave., Cleveland, Ohio
"American Machinist," March 9, 1922



The machine is used in the foundry for filling large flasks, and is self-contained. Standard link chains carrying specially shaped buckets run on the sprockets driven by an electric motor. The capacity depends upon the amount of sand to be handled. The machine is controlled by push buttons, located at the end of the discharge chute. If the machine is stationary, the flasks may be brought to it on cars.

Clip, paste on 3 x 5-in. cards and file as desired

Trade Catalogs

Boston Gears. Boston Gear Works, Norfolk Downs, Quincy, Mass. Catalog No. 40, 1922 edition, illustrating and describing with specifications and price lists attached, a line of 600,000 standardized Boston gears. A special section of the catalog is devoted to a description of the latest models of steel and iron internal gears for use with Boston pinions of less than twelve teeth. The book presents a small, compact arrangement of material, making it easy to find any type or size of gear wanted.

Small Tools. Greenfield Tap and Die Corporation, Greenfield, Mass. Catalog No. 46-A, containing almost 400 pages of descriptive matter on taps and dies, screw plates, drills and reamers, milling cutters and pipe tools. A large variety of these various tools are described and illustrated with specifications and price lists included. Tables of British standard pipe threads, Morse and Browne & Sharpe tapers, U. S. standard gage, tables of weights of sheet copper, wire gage standards, copper wire tables, squares, cubes, circumferences and areas of circles, decimal equivalent of fractions, metric and English equivalent measures and a variety of other useful information make up this very comprehensive booklet.

Ingersoll Milling Machine. Ingersoll Milling Machine Co., Rockford Ill. A six-page circular describing the latest Ingersoll adjustable rotary milling machine. Most of the space is devoted to photographs of the machine in actual operation in the Ingersoll shops. These photographs show the various special features of the machine and tell the story better than words.

Pneumatic Drills. Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. A small circular describing the latest type of "Pigmy" No. 25, No. 375 and No. 50 pneumatic drills. Specifications for each type are included.

Refrigerating Machinery. Howe Ice Machine Co., 2815 Montrose Ave., Chicago, Ill. A twenty-page catalog illustrating and describing the principal features that make up the Howe ammonia compressors for ice and refrigerating machines. Cross-section drawings and a series of halftone photographs show the intricate details of design and construction of these machines. Several photographs of Howe refrigerating and freezing apparatus at work in factories and in ice plants are shown.

Silent Hoist. The Silent Hoist Co., Brooklyn, N. Y. Bulletin No. 16 describing the silent hoist friction drum hoist and vertical winches with gasoline engine drive, which also can be furnished with electric motor drive up to 50 hp. This new type of hoist is especially adaptable for hoisting girders in industrial plants and for construction work.

Circuit Breakers. Roller-Smith Co., 233 Broadway, New York City. Bulletin No. 560, illustrating and describing types "E" and "T" inclosed circuit breakers. Specifications and price lists are included. Bulletin No. 820, of the same company, describes a line of ammeters and voltmeters, as well as COD indicators, all products of the Roller-Smith Co.

Heat-Treating Furnaces. W. S. Rockwell Co., 50 Church St., New York City. Bulletin No. 242, a supplement to the series of educational papers previously issued by this company and intended to illustrate the variety of methods of applying the principles of proper heating and handling to different manufacturing requirements and shop conditions. This bulletin covers the influence and method of heating on the quality and cost of heat-treated products. The illustrations show the Rockwell furnaces in operation and charts show different designs and sizes of the furnaces.

Athol-Starrett Vises. Athol Machine and Foundry Co., Athol, Mass. Catalog No. 35 illustrating and describing a line of Athol-Starrett vises, hardware specialties and machinery. Among the types mentioned are U-beam vise, ratchet handle plumber's vise, combination pipe vise, quick-acting woodworker's vise, machinist's vise, drill press and milling machine vise, clamp base, stationary base and jaw, swivel base and stationary jaw, small portable grindstone, grindstone frame, bench grinder countershaft, and a large variety of parts for the various machines mentioned.

Una-Flow Engine. The Stumpf Una-Flow Engine Co., Inc., Syracuse, N. Y. A leaflet describing this new type of engine, which as its title indicates is an engine in which the steam flows through the cylinder in one direction only.

Garvin Facts. The Garvin Machine Co., New York, N. Y. An interesting pamphlet presenting some valuable suggestions in the matter of purchasing second-hand machinery. It is addressed to purchasing agents, superintendents, foremen, managers and financial officers. To each one of these executives is devoted a page in which facts concerning the purchase of second-hand machine tools are presented. It concludes with a message to prospective buyers that "your wisdom will be determined by results, not price."

"Twistest." J. S. Imlach, Ottawa, Canada. A six-page folder describing and illustrating a tool that tests connecting rods both ways at the same time, and which magnifies any error that exists. The illustrations show the operation of the device in its various positions.

Turret Machines. The Warner & Swasey Co., Cleveland, Ohio. A well prepared 36-page catalog illustrating and describing a complete line of accurate, durable machines for bar and chucking work. The contents include turret lathes, universal hollow-hexagon turret lathes for heavy operations, and plain and universal turret lathes for brass work. Each type is fully illustrated and described with tables of operations showing capacity of work which each machine is capable of performing. Three pages are devoted to codes which make it easy for the purchaser to order machines or equipment.

Whitney Coupling. Kay Manufacturing Co., Norwalk, Conn. Circular 1922 describing the Whitney free-floating coupling for transmitting power from one shaft to another, which shafts are not in alignment. A table of dimensions and a price list are included.

Small Tools. Alfred Herbert, 13 British Indian St., Calcutta, India. Alfred Herbert, Ltd. has issued a quarterly stock list including prices of the small tools handled by the company. The booklet might offer interesting comparisons to American dealers.

Simplex Jacks. Templeton, Kenly & Co., Ltd., 4020 South Central Ave., Chicago, Ill. A 24-page catalog describing a line of Simplex jacks manufactured by the above company for railroads, contractors, mining and oil producing industries, public service utilities, automobiles and trucks. It presents an interesting study of the principles that govern the capacities of jacks and presents detailed drawings of the construction of Simplex jacks so as to conform to the principles as outlined.

Jacobs Chucks. The Jacobs Manufacturing Co., 984 Park St, Hartford, Conn. A new catalog, No. 817, illustrating and describing a complete line of both Jacobs improved drill chucks and the new Jacobs super-chucks. Complete price lists of all sizes and types are included.

Rego "Little Six." The Bastian-Blessing Co., 125 W. Austin Ave., Chicago, Ill. A small folder describing the "Little Six" outfit which gets its trade name from the fact that it is made to perform six operations as follows: Welding, cutting, brazing, lead burning or welding, radiator repair, and decarbonizing. It is intended for the garage or repair shop.

Gear Grinders. The Garrison Gear Grinder Co., Dayton, Ohio. A small booklet describing the Garrison gear grinder which automatically generates perfect tooth contours of any pressure angle. The construction of the machine is described minutely.

Power King. Jones, MacNeal & Camp, Warsaw, Ind. A four-page folder describing a line of Power King electric drills embodying the special features of full ball bearings, oversize motors and two speeds. The drill is described in detail by means of an illustration with the special features numbered and described in the margin.

Handbook of Conveyor Practice. Robins Conveying Belt Co., 13 Park Row, New York, N. Y. A 96-page handbook prepared by the Robbins company as an aid to engineers and draftsmen having to do with the planning or designing of conveyor installations. It contains a group of new and useful tables concerning capacities, power requirements, speeds of conveyors and similar matters; dimensions of the various conveyor parts, together with general data on conveyor practice. There is a section devoted to the description and illustration of installations of various kinds designed and erected by this company. There are also charts for determining steam and horsepower of transmission pulleys and belts, shaft diameters, horsepower of gears, and for finding the slopes of valleys in chutes and hoppers. The book is well prepared on heavy coated stock with excellent binding and covers.

Norton Alundum Safety Tile. The Norton Company, Worcester, Mass. A twenty-page booklet giving specifications for the proper installation of Norton Alundum safety tile. This information should be invaluable to architects and engineers who use Norton tile in their construction work. A series of excellent drawings are included which show clearly the various types of construction in which this safety tile is used.

Micarta Gears and Pinions. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa. Circular No. 1579-B of the Westinghouse company, describing and illustrating this latest development in the field of silent gearing. Micarta is a non-metallic material developed by the Westinghouse company for gear and pinion application. It can be advantageously substituted for untreated steel, cast iron, bronze and all non-metallic materials commonly employed for gearing. The bulletin gives the distinctive features and the physical and mechanical properties of micarta in detail. A table of drawings showing designs of micarta gears and two pages of gear data and horsepower rating make the catalog most complete.

Magnetic Chucks. O. S. Walker Co., Inc., Worcester, Mass. Circular W2. 16 pages describing the Walker magnetic chucks of the rectangular, swiveling and vertical face types, in all of which the single coil or single magnet type of construction is a prevailing feature of the design. The illustrations show the parts which go into the making of a Walker chuck, and give the reader an excellent idea of the operation of a complete chuck. Other illustrations show the chuck in use on grinding machines. Another section gives tables of dimensions for chucks of the rectangular type, and also specifications. Two pages of the bulletin are devoted to a description of the Walker demagnetizer.

Sandblast Machines. Hoevel Manufacturing Corporation (controlled by the L. O. Koven & Bros. Co., 154 Ogden Ave., Jersey City, N. J.). The 1922 catalog of the Hoevel concern, illustrating and describing all the latest types of sand blasting machines for industrial purposes. The book shows machines for removing scale, rust, dirt and grease from castings before nickel plating, galvanizing or painting, and for other cleaning or polishing purposes.

Worthington Diesel Engines. The Worthington Pump and Machinery Corporation, 115 Broadway, New York, N. Y. Bulletin VK-1851-A, illustrating and describing the new Worthington Diesel engine of the two-cycle, solid injection type. A large cross-sectional photograph of the engine with the parts numbered and described in the margin is a feature of the catalog.

Hammered Crucible Tool Steel. McInnes Steel Co., Ltd., Corry, Pa. A small booklet describing the line of high-grade hammered crucible tool steel products manufactured by this company. Some of the items mentioned are vanadium, cello vanadium, clear point, superior, misco, special chrome, chrome nickel, tool steel forgings, gear blanks, forgings, weldless rings, hammered spindles, axle forgings, connecting rods and McInnes special tool steel. Each one of these types is briefly described, and the proper method for hardening and tempering is given.

Monitor Thermaload Starter. Monitor Controller Co., Baltimore, Md. A circular entitled "Keep Your Machines Running," briefly describes this thermaload starter, which is suited to any kind of machinery driven by alternating current motors.

Milliken Machine Tool Specialties. Milliken Machine Co., West Newton, Mass. Small circular describing the line of standard cast-iron surface plates, bench plates, angle plates, ball turret heads and slide-rests.

Forthcoming Meetings

American Railway Association: Section III, Mechanical: Annual meeting, Atlantic City, June 14 to 21. (Formerly the Master Car Builders and the Association of Master Mechanics.)

Society of Automotive Engineers: Summer meeting, White Sulphur Springs, W. Va., June 20 to 24. C. F. Scott, 29 West 39th St., New York City, is chairman of the convention committee.

American Society for Testing Materials: Twenty-fifth annual meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 26 to July 1. Secretary, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Reamer Driving Machine

George H. Blettner Co., 1841 W. Jackson Blvd., Chicago, Ill.

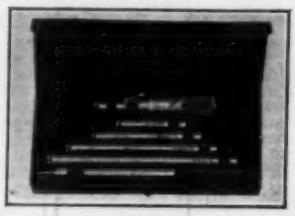
"American Machinist," March 9, 1922

The machine furnishes power for reaming operations ordinarily done by hand. It will drive hand, expansion, adjustable or special reamers up to 1¼ in. in diameter. The spindle speeds are 10, 20 and 30 r.p.m. The spindle is fitted with a 5-in. Cushman geared scroll chuck. The motor has ¼ hp. and can be supplied for either a.c. or d.c. of 32, 110 or 220 volts. Height, 42 in. Floor space, 18 x 18 in. Weight, 145 pounds.

Micrometer, Inside, Extension

Reed Small Tool Works, Cherry and Vine Sts., Worcester, Mass.

"American Machinist," March 9, 1922

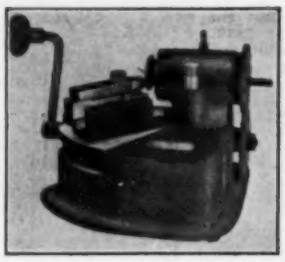


The micrometer is used to obtain internal measurements of cylinders and rings, but is useful as well in linear measurements, testing parallel surfaces, comparing gages and setting calipers. The detachable handle can be changed for right- or left-hand work. Extra rods, screwing on the threaded stud at the end of the barrel, give a change of length. The standard set consists of the inside micrometer, an adjusting wrench and five rods, giving a range from 3 to 8 in. Additional rods for measuring greater lengths, also a handle for gaging to greater depths in cylinders, can be furnished.

Lathe, Valve, Hand-Operated, "Peerless"

Steiner Brothers, Lima, Ohio

"American Machinist," March 9, 1922

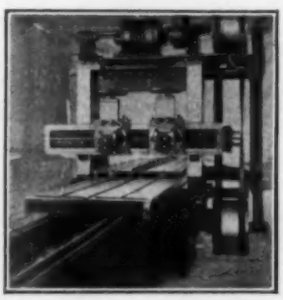


The valve is held in place in the hollow spindle by means of a special self-centering chuck. Valves having stems from ¼ to ⅞ in. in diameter and heads up to 3 in. in diameter can be held. The valve is rotated by a lever. A high-speed removable cutting tool is used, mounted in a slide that can be swung through an angle of over 30 deg. As the driving handle is turned, the toolslide is automatically fed inward. The worm wheel can be disengaged by the knurled knob at the side of the spindle housing, so that the toolslide can be moved by hand.

Planer, High-Speed

Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass.

"American Machinist," March 16, 1922

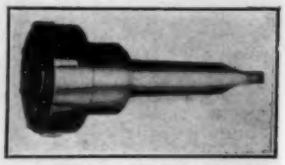


The planer table operates at a speed of 150 ft. per minute on both the cutting and return strokes. Brass screen plates about 13 x 30 in. in size are planed. The shaft carrying the tight and loose pulleys passes entirely through the bed, and carries a pulley driving the second belt. The table contains T-slots, but no holes. The steel rack extends for the full length of the table. Two heads are mounted on the crossrail, both running on the lower screw. The capacity is 26 x 32 x 18 in. Minimum distance between tools, 12 in.

Reamer, Expanding, Cylinder

Campbell Auto Works, 238 N. El Dorado St., Stockton, Cal.

"American Machinist," March 9, 1922



The tool is used for re-boring and finishing automobile cylinders. The head screws on a boring bar that can be fitted to any type of cylinder boring machine, and it may also be used for turret machines. It has an expansion of ⅝ in., adjusted by means of a screwdriver and a micrometer. The adjusting mechanism is concealed inside the head, and by turning the large central adjusting screw, the blades may be forced outward or inward. After adjustment, the eight screws are tightened into place and the blades thus locked in position. The tool is made in several sizes, the largest of which is 4¼ in. in diameter.

Threading Machine, Staybolt

Warner & Swasey Co., Cleveland, Ohio

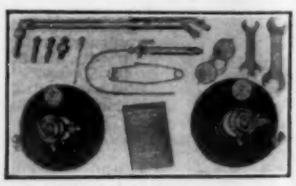
"American Machinist," March 9, 1922

The machine is made up of the standard No. 4 turret lathe with a special attachment instead of the regular turret slide and saddle, and it may be used for the production of the studs and bolts, as well as staybolts. The machine handles crown stays, button-head stays and swivel stays up to 40 in. in length, and cuts any size of thread, using self-opening die heads. After the staybolt is chucked in position, the staybolt carriage is fed forward. The head is then formed by a forming cutter on the cross-slide, the staybolt carriage is fed forward, and the die heads close automatically and cut the threads.

Welding Outfit, "Little Six," Rego

Bastian-Blessing Co., 125 W. Austin Ave., Chicago, Ill.

"American Machinist," March 9, 1922

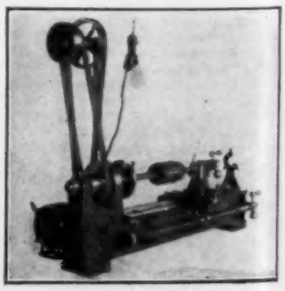


The outfit, made up of standard units of Rego equipment, is primarily for use in general garage repair work. The welding torch, equipped with three copper one-piece welding tips, will weld steel up to 1 in. in thickness, or with a cutting tip will cut steel up to 1 in. in thickness. Special tips are provided for brazing, lead burning or welding, and repairing radiators; and a decarbonizing torch for removing carbon from the combustion chambers of automobile cylinders. The other apparatus furnished consists of the oxygen and acetylene regulators, hose, wrenches, spectacles, spark lighter, and an instruction book.

Lathe, Bench, Motor-Driven

A. V. Carroll Machine Tool Co., Norwood, Cincinnati, Ohio

"American Machinist," March 16, 1922



The lathe countershaft is mounted on a 1¼-in. steel bar fitting in an extension support cast on the bed. The spindle has a ⅝-in. hole. The carriage, gibbed to the bed, is traversed by a long screw at the front. Feeds are operated by hand, and the driving motor can be operated from an ordinary lamp socket. Voltage and current should be specified. Equipment: motor, cord and plug, faceplate, centers, center rest and wrenches. Swing, 10 in. Distance between centers, 24 inches.

Clip, paste on 3 x 5-in. cards and file as desired

New and Enlarged Shops

Machine Tools Wanted

Cal., Los Angeles—R. Neul, 1334 East 63rd St.—one power lathe for machine shop.

Ill., Chicago—Chicago Pump Co., 2336 Wolfram St.—one 24 in. Ingersoll cutter grinder (used).

Ill., Chicago—E. Edtbauer & Co., 224 North Desplaines St.—one plain milling machine (No. 2 or 3).

Kan., Wichita—G. P. Cain, 1518 Poince St.—power drill press and emery wheel, for machine shop.

Kan., Wichita—J. O. Coleman, 106 North 3rd St.—power drills and grinders for machine shop.

Kan., Wichita—Day & Night Repair Shop, 222½ North Market St.—one power lathe.

Kan., Wichita—W. Gunning, 120 North St. Paul St.—power lathe for garage.

Kan., Wichita—H. Hoopper, Forum Garage—one power drill press and lathe.

Kan., Wichita—Palace Garage, 136 North St. Paul St.—emery wheel, drill press, lathe and cylinder grinder for power equipment.

Kan., Wichita—J. Ryan, Park Place—one power lathe.

Kan., Wichita—The Smith Machine Shop, 132 North Lawrence St., O. G. Smith, Purch. Agt.—power lathe and automobile cylinder grinder.

Kan., Wichita—Standard Cutlery Co., 154 North Market St., F. Mercier, Purch. Agt.—one power grinder for sharpening cutlery.

Kan., Wichita—Wichita Desicating Co., 911 Bentley Ave., J. R. Johnson, Purch. Agt.—one power lathe and one drill press.

Mich., Detroit—The F. J. Lamb Co., 928 Franklin St.—Numbers 1 and 2 Warner and Swasey hand screw machines.

Mich., Saginaw—I. L. Gunther, 128 North Franklin St.—one 10 x 30 in. Norton grinder.

Neb., Lincoln—J. H. Markel Motor Co., 1726 O St., W. F. Boys, Purch. Agt.—one 20 in. drill press, one 18 in. lathe, 7 or 8 ft. bed, both with motor attached; one air hammer, one air hose and attachments for 12 openings; one motor cleaning machine; blacksmith shop equipment including anvil, forge, and small tools; one bench grinder; one chain hoist and machine; one electric test stand.

Neb., Lincoln—Reliable Auto Tinners, 238 South 10th St., H. Fattig, Purch. Agt.—one power emery wheel and grinder, combined.

N. Y., Lewiston—F. Seick—machinery and tools for garage and repair shop now under construction.

N. J., Newark—W. H. Hall, 583 18th Ave.—50 lb. trip hammer.

N. Y., New York—The Cornell Iron Wks., 601 West 26th St.—one power punch press.

N. Y., Rochester—Brockway oMtor Truck Co., Cortland—machinery and equipment for service station and shop.

N. C., Asheville—Asheville Supply & Fdry. Co., H. J. Sutton, Secy.-Pres.—one 24 or 36 in. punch and shear, belt or electrically driven.

O., Cleveland—The Bd. of Educ., East 6th and Rockwell Sts., H. E. Boppel, Purch. Agt.—four saw benches, one cabinet planer, one hollow chisel mortiser, one block sander, four band saws, four hand jointers, four oil stone grinders, four lathes, four 10 in. bench drill presses, four 2 wheel grinders, four squaring machines, four bar folding machines, four punch and shear machines, four forming rollers, four burring machines, four turning machines, four wiring machines, four hand forges, for use in Audubon, Patrick Henry and Rawlings Junior high school.

O., Columbus—Modern System Grocery Co., 178 North 4th St., J. W. Baker, Pres.—equipment for proposed garage, on Lazell and Hickory Sts., capacity, 30 grocery trucks.

O., Columbus—The Sterns Lubricator Co., 395 East Broad St., C. H. Neil, Pres.—boring machines, grinders, polishers, etc., for new plant, at Cleveland Ave. and Colfax St.

O., Logan—Logan Fdry. & Machine Shop—machinery and equipment for large addition.

Pa., Frankford—Fidelity Machine Co., 4015 Paul St.—additional machinery for new factory.

Pa., Phila.—Rochlis Iron Wks., 1518 North 5th St.—shearing machinery, punch presses and bending machines for ornamental iron work.

Va., Waynesboro—Service, Gas and Supply Co., K. P. Wright, Mgr.—small tools and equipment for garage.

Wis., Milwaukee—The Economy Sheet Metal Wks., 305 Grove St., H. Rumpel, Purch. Agt.—30 in. square shears.

Wis., Milwaukee—Nash Motors Corp., Clement and Oklahoma Ave., (address Purch. Dept. Plant No. 4)—punch presses, boring machines, and other machinery and equiment for new plant now under construction, (body plant and sheet plant).

Wis., Milwaukee—J. Zapf, 1341 40th St.—one saw table, 1 sticker, and electric motors.

Ont., Galt—A. D. Porter Mfg. Co., Hobson St.—equipment and tools for the manufacture of pressed steel and brass products for the plumbing trade, and specialties for hardware, shoe and furniture trades.

Ont., Peterborough—Motors & Machines, Ltd., A. E. Adams, Pres. & Mgr.—equipment for machine shop.

Ont., St. Williams—McCall & Co.—one 12 in. 4 sided planer, one 24 and one 26 in. 1 sided planer, one re saw, one swing saw 6 in. frame and two r.i.p. saws, one variety saw and one 36 in. band saw, one high speed shaper, one sash sticker, one 2 spindle boring and one 4 spindle verticle boring, one 16 in. and one 12 in. jointers, one elbow sander and one 2 drive sander, one turning lathe, one band saw filer, one blower side face, one chain mortiser.

Que., Montreal—H. J. Bowen, 293 Notre Dame St. W.—one small lathe and complete equipment for garage and repair shop.

Que., Montreal—I. P. Choquette, 900 St. Denis St.—one grinder, small machinery and tools for garage and auto repair shop.

Machinery Wanted

Cal., Los Angeles—Bittleston Shop, 335 South Los Angeles St.—tinners machinery.

Fla., Jacksonville—H. W. Dexter, 16th St.—one 20 ton sidewheel, M. C. B. equipped locomotive crane; one 30 h.p. single driven hoisting engine; two 30 h.p. double driven hoists with boilers; one 650 kw. 240 volt D.C. generator, belt driven.

Fla., Lakeland—Non-Acid Fertilizer and Chemical Co., H. E. Memminger, Mgr.—machinery and equipment for proposed fertilizer plant, incl. engines, boilers, dryers, tanks, etc.

Fla., Leesburg—The Municipal Ice Plant, W. E. Rogers, Mgr.—additional machinery for ice plant.

Fla., Milligan—J. L. and C. Wilkinson Mfg. Co., C. Wilkinson, Secy.—additional machinery for the manufacture of crates and boxes at woodworking plant.

Ga., Atlanta—The Western Newspaper Union, 127 Central Ave., brokers,—Meihle or Premier press, automatic feeder for cylinder press for power equipment.

Ill., Chicago—The Western Newspaper Union, 210 South Desplaines St., brokers—8 page double driven angle bar Duplex press power equipment.

Ill., Sycamore—Chicago Wire & Mfg. Co.—one cement mixer, 1 or 2 yd. capacity.

Kan., Girard—W. H. Wayland—automatic air outfit, tank, pump belt and motor.

Kan., Wichita—J. Coss, 716 North Market St.—woodworking machinery, combination saw, planer and cutting off equipment for power.

Kan., Wichita—The Brooks Letter & Addressing Co., 144 North Market St., H. O. Brooks, Purch. Agt.—power paper cutter and job press with Miller feeder.

Kan., Wichita—West Side Planing Mill Co., West Side—one power sander for wood working.

Mo., Kansas City—Midwest Auto Supply Co., 416 East 15th St.—automatic air outfit pump and motor air tank.

Mo., Kansas City—E. N. Wright, 707 Sharp Bldg.—stereotype machinery, incl. 1 moulding machine; 1 full page shaving machine; one 8 column flat casting box for both thin plate and type high; 1 saw trimmer and 1 steam table.

Mo., Valley Park—Barbour Boat Co.—tinsmith tools, furring machine and turning machine.

N. Y., Addison—Dairymen's Co-operative League Assn., H. E. Austin, Mgr. Cheese Factory—machinery and complete equipment for the manufacture of cheese.

N. Y., Binghamton—Tichener Iron Wks., L. E. Barnes, Secy.—machinery and equipment for proposed addition to architectural and ornamental iron works.

N. Y., Buffalo—J. Brand, 502 Swan St.—equipment for proposed bakery, at 369 East Genesee St.

N. Y., Buffalo—H. R. Conners and A. McClerie, Military Rd. and Hertel Ave.—one gasoline pump, 1 gas tank, 2,000 gal. capacity, and other minor equipment for proposed service station.

N. Y., Buffalo—Harvey Laundry Co., Inc.—extractors, revolving tubs, and other machinery and equipment for proposed laundry.

N. Y., Dansville—Newfield Gas & Oil Co., Inc.—pumps, pipe, machinery and equipment for gasoline extraction plant.

N. Y., Niagara Falls—Kimberly-Clark Paper Co., Packard Rd.—grinders (paper), machinery for pulphouse, also machinery and equipment for screen room, etc., for proposed factory.

N. Y., Painted Post—S. Miles, R. D. 1—large power grain binding machine.

N. Y., Patchogue—Advance, J. A. Canfield, Purch. Agt.—newspaper folder, power saw trimmer and router.

N. Y., Rochester—J. C. Haag, Fernwood Ave.—gas pump, air compressor, tank and general machinery and equipment for large commercial garage now under construction.

N. Y., Syracuse—Cloverland Ice Cream Co., 533 South Ave.—equipment and machinery for ice cream plant now under construction.

N. Y., Vestal—Universal Instruments & Metal Co., R. Mulliner, Pres.—special machinery and equipment for the manufacture of patented clothes line fasteners.

N. C., Brevard—H. C. Brevard—machinery for proposed ice and cold storage plant.

N. C., Washington—R. R. Zoeller, Cotton Mill—cotton gin, also blower and power pump to be used with cotton presses (used).

N. C., Wilmington—The Lingo City Metal Wks., T. D. Love, Purch. Agt.—veneer and slat making machines for veneer crates.

O., Cleveland—E. F. Hauserman Co., 1729 East 22nd St.—one draw bench for cold drawn steel shapes, chain beam and gearing 15 tons, length of beam 50 ft., head to have 8 openings and adjustable side gauges.

O., Cleveland—The Hunting Constr. Co., 823 Cleveland Discount Bldg.—one ¾ yd. grab bucket locomotive crane.

O., Columbus—Dept. Pub. Welfare, 9th and Oak Sts., H. S. MacAyeal, Dir.—bakery and mixing machines, ovens etc., laundry equipment, extractors, mangles and washing machines all for laundry and bake shop to be erected at Institution for Feeble Minded.

O., Marion—The Harding High School Students, H. R. McVey, Supt.—complete printing establishment. Estimated cost $1,000.

O., South Euclid—Random Shots, H. E. Burdett, Purch. Agt.—newspaper press and power paper cutter.

The Weekly Price Guide

Rise and Fall of Market

Advances.—Rise in coke prices forces No. 2 foundry iron up $1 per gross ton in New York, Birmingham, Pittsburgh and Chicago. Pittsburgh price of $1.60 per 100 lb., for structural shapes, plates and bars, giving way to quotations of $1.70@$1.75; steel bars principally affected. Blue annealed sheets up 15c in New York; Chicago quotes rise of 25c on blue annealed, 20c. on black and 15c. per 100 lb. on galvanized sheets. New York warehouses advance openhearth spring steel, ½c.; bands and hoop steel 25c.; tank and floor plates, shapes and bars, 10c. per lb. Chicago advances coppered bessemer rods and hoop steel, 35c.; floor plates, cold drawn shafting, squares, flats, hexagons, etc., 10c.; shapes and bars, 30c. per lb.

Zinc quoted at 6½c. as against 6c. per lb., New York; markets weaker in electrolytic copper, lead and tin. Wrought brass and copper ½c. higher in New York and Cleveland. Solder up 2c. in New York; babbitt metal up ½c. per lb. in Cleveland.

Declines.—Raw linseed oil down 2c. per gal. in New York and Chicago. Machine oil reduced 10c. and lard cutting oil 5c. per gal. in New York.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$23.50
Northern Basic	25.02
Southern Ohio No. 2	25.02
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	29.16
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	26.82
Virginia No. 2	28.74
Basic	25.50
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	23.00
No. 2 Foundry, Southern, sil 2.25@2.75	25.17
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	25.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Pittsburgh	9.0	6.0	3.0
Philadelphia	8.5	5.0	3.0
Atlanta	5.5	4.5	4.0
Detroit	7.0	4.5	3.0
Birmingham	12.0	6.5	3.0
Minneapolis	9.0	6.0	4.5
New York	9@10	6.0	3.0
Cleveland	6.75	4.5	2.6
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.40	3.63	3.15	3.63
No. 12	2.45	3.68	3.20	3.68
No. 14	2.50	3.73	3.25	3.73
No. 16	2.70	3.83	3.35	3.83
Black				
Nos. 17 and 21.	3.00	4.15	3.55	4.30
Nos. 22 and 24.	3.05	4.20	3.60	4.30
Nos. 25 and 26.	3.10	4.25	3.65	4.35
No. 28	3.15	4.35	3.90	4.45
Galvanized steel sheets:				
Nos. 10 and 11.	3.30	4.35	3.75	4.45
Nos. 12 and 14.	3.40	4.45	3.85	4.55
Nos. 17 and 21.	3.55	4.75	4.15	4.85
Nos. 22 and 24.	3.70	4.90	4.45	5.00
No. 26	3.85	5.05	4.60	5.15
No. 28	4.15	5.35	4.90	5.45

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	71	58½	¾ to 1½	44½	29½
LAP WELD					
2	64	51½	2	39½	25½
2½ to 6	68	55½	2½ to 4	42½	29½
7 to 8	65	51½	4½ to 6	42½	29½
9 to 12	64	50½	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	69	57½	¾ to 1½	44½	30½
2 to 3	70	58½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	62	50½	2	40½	27½
2½ to 4	66	54½	2½ to 4	43½	31½
4½ to 6	65	53½	4½ to 6	42½	30½
7 to 8	61	47½	7 to 8	35½	23½
9 to 12	55	41½	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	66%	53%	60½%	47½%	62½%	48½%
2½ to 6 in. steel lap welded	61%	47%	58½%	44½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6@8	6.00	6.00
Coppered Bessemer rods(base)	6.03	8.00	6.85
Hoop steel	3.63	2.81	3.48
Cold rolled strip steel	6.25	8.25	6.15
Floor plates	4.80	4.66	5.08
Cold finished shafting or screw	3.35	3.00	3.40
Cold finished flats, squares	3.85	3.50	3.90
Structural shapes (base)	2.68	2.51	2.68
Soft steel bars (base)	2.58	2.41	2.58
Soft steel bar shapes (base)	2.58	2.41	2.58
Soft steel bands (base)	3.23	3.06	2.58
Tank plates (base)	2.68	2.51	2.38
Bar iron (2.10@2.20 at mill)	2.58	2.21	2.28
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
5/32	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	32.12½
Lead (up to carlots), St. Louis, 5.65; New York	6.50
Zinc (up to carlots), St. Louis, 5.42½; New York	6.25

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	18.00
Antimony (Chinese), ton spot	6@6.12½	7.50	6.25
Copper sheets, base	20.50	20@21½	23.00
Copper wire (carlots)	16.00	16.50	16.25
Copper rods (ton lots)	19.00	21.50	19.50
Copper tubing (100-lb. lots)	22.75	23.00	23.00
Brass sheets (100-lb. lots)	16.75	17.50	18.75
Brass tubing (100-lb. lots)	20.00	19.00	20.50

—Shop Materials and Supplies

METALS—Continued

Brass rods (1,000-lb. lots)	14.75	15.50	15.75
Brass wire (carlots)	17.25	17.75	.....
Zinc sheets (casks)	8.50	17.25	15.75
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	.....
Solder (½ and ½), (caselots)	25.00	22.00	19.00
Babbitt metal (fair grade)	35.00	42.50	36.00
Babbitt metal (commercial)	15.50	16.00	9.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	11.75	10.25
Copper, heavy, and wire	12.00	11.25	9.25
Copper, light, and bottoms	10.00	9.50	8.25
Lead, heavy	4.75	....	3.65
Lead, tea	4.25	3.50	3.00
Brass, heavy	7.00	6.50	....
Brass, light	6.00	5.00	4.75
No. 1 yellow brass turnings	6.50	6.00	5.00
Zinc	3.00	3.00	2.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	11.00	14.50
IC,	112 sheets	12.80	11.40	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	5.60	7.25
IC,	14x20	7.25	5.85	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.09
Wiping cloths per M., 13½x13½	.....	50.00	55.00
Wiping cloths per M., 13½x20½	.....	55.00	65.00
Sal soda, 100 lb. lots	2.80	2.50	2.65
Roll sulphur, 360 lb. bbl., per 100 lb	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.86	1.00	.96
White lead, dry or in oil	100 lb. kegs.	New York,	12.50
Red lead, dry	100 lb. kegs.	New York,	12.50
Red lead, in oil	100 lb. kegs.	New York,	14.00
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton		$7.00
Coke, prompt foundry, Connellsville	per net ton		$7.50

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	60-10%	60-10%	60%
1½ and 1¼x3 in. up to 12 in.	60%	60-10-10%	60-10%
With cold punched sq. nuts	40%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	.....	$4.00 off
Button head bolts, with hex. nuts	30%	$3.90 net	.....
Hex. head and hex. nut bolts	35%	.....	65-5%
Lag screws, coach screws	60-5%	.....	60-5%
Square and hex. head cap screws	75—10%	75%	70-10%
Carriage bolts, up to 1 in. x 30 in.	45%	60%	50-5%
Bolt ends, with hot pressed nuts	55%	.....	55%
Tap bolts, (h. h. plus std. extra of 10%)	15%	.....	.....
Semi-finished nuts ⅝ and larger	70%	75-5%	80%
Case-hardened nuts	65%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	5.00	3.50	3.50
Washers, round plate, per 100 lb. Off list	5.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	3.25	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	3.25	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	60-10%	70%	60-10%
Rivets, tinned	60-10%	70%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.60	$3.25	$3 10
Cone heads, ditto (net)	3.70	3.35	3.20
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.35 base
Copper rivets	55-5%	50%	50-10%
Copper burs	35%	50%	.....
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine oil, lubricating, (50 gal. bbl.) per gal.	0.40	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50%	50-5%	60-10%
Medium grade	40-5%	40-10-2½%	50%
Heavy grade	35%	40%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets, Flint paper	$5.84	$3.85	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	32.75	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	.....	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	.....	1.49
Cloth	3.02	.....	3.20

Okla., Tulsa—G. S. Henry, 311 Kennedy Bldg.—one National machine (number 3) for oil drilling.

Pa., Franklin—Galena Signal Oil Co., C. A. Miller, Supt.—equipment and machinery for proposed refinery at Point Richmond, Cal.

Pa., Franklin—Lakeside Refining Co.—large cracking stills for refinery.

Pa., Pittsfield—M. E. Barton, Route 1—machinery and equipment for shoe repair shop.

Pa., Ridgway—H. R. Smith & Co.—machinery and equipment for proposed tannery, at West Hickory.

Pa., Sharon—Sharon Furniture Co., Inc., J. Canteloupe, Pres.—Machinery for the manufacture of furniture.

Pa., Sharon—The Valley Packing Co.—machinery and equipment for proposed fruit packing plant addition.

Pa., York—F. A. Burrows Mfg. Co., J. J. Mace, Purch. Agt.—machinery and equipment for the manufacture of steam appliances.

S. C., Saluda—R. H. Etheridge, Woodworking mill—four side planer and masher, for use with blower system (used).

S. D., Florence—J. O'Neil—complete printing outfit, presses, paper cutter.

Tenn., Nashville—Hermitage Portland Cement Co., 3rd Ave. N., R. T. Miller, Secy. & Mgr.—receiving bids until July 1, on cement mill machinery and equipment for plant under construction.

Va., Cedarbluff—Clinch Valley Blanket Mill—equipment (for the manufacture of blankets and similar cotton and woolen goods) incl. engines, boilers, spoolers, extractors, looms, rag-pickers, etc.

Va., Norton—Norton Mattress Co., C. M. Bandy, Pres.—additional machinery and equipment for plant.

Va., Stuart—Stuart Cold Storage Co., J. F. Reynolds, Secy.—cold storage machinery and equipment.

Va., West Point—J. W. Marshall, flour mill—geared air conveyor equipment for sucking wheat from holds of vessels, (new or used).

W. Va., New Martinsville—Bd. of Educ., S. Bruce Hall, Pres.—equipment for vocational department of proposed high school.

Wis., Cudahy—Cudahy Brown Co., 626 Whitaker Ave., J. Lewanowsky, Purch. Agt.—special machinery for the manufacture of brooms.

Wis., Janesville—The City of Janesville c/o Clerk—machinery and equipment, including bucket conveyors, for gravel pit.

Wis., Mellon—Universal Toy & Novelty Co.—woodworking mchy. for proposed toy factory.

Wis., Milwaukee—Barg & Foster, 171 Bway; W. H. Barg, Purch. Agt.—machinery for the manufacture of candy, incl. gas furnace.

Wis., Milwaukee—N. J. Bertha, 1094 Newhall St.—one electric charging machine for garage.

Wis., Milwaukee—H. J. Esser, 82 Wisconsin St., Archt. and Engr., for Claybourn Process Corp.—one 3 ton and one 10 ton cranes for proposed plant.

Wis., Milwaukee—M. Feldman, 1513 Cherry St.—complete equipment and machinery for laundry.

Wis., Milwaukee—The Kidwell Boiler & Engine Co., 288 East Water St.—boiler shop equipment.

Wis., Omro—Omro Co-operative Butter & Cheese Co.—equipment for proposed modern creamery and cheese factory.

Wis., Racine—Belle City Incubator Co., 15th St.—one monorail crane.

Wis., Slinger—E. C. Kohl—machinery for laundry.

Wis., Wautoma—L. Chaimson—seed grinding machinery to be used with gas engine power.

Ont., Huntsville—Muskoko Wood Mfg. Co.—special machinery and equipment for the manufacture of wood products for proposed plant.

Ont., London—Carling Brewery Co.—equipment for the manufacture of near beer.

Ont., Ottawa—F. H. Plant, Ltd., 107 Murray St.—woodworking machinery for proposed wagon factory.

Ont., Toronto—The Wilson-McGovern Co., Ltd., Lumsden Bldg.—one 15 ton, four wheel, narrow gage locomotive crane (used).

Ont., Welland—Universal Casket Co., B. A. Basque, Pres.—special machinery for the manufacture of caskets for proposed plant.

Que., Montreal—S. Meer, 1618 Bordeaux St.—equipment for blacksmith shop and foundry.

Metal Working Shops

Cal., Bakersfield—Atchison, Topeka & Santa Fe R. R., Ry. Exch., Chicago, Ill., is having plans prepared for the construction of machine shops, etc., on a 20 acre site, here. Estimated cost $400,000. R. B. Ball, c/o Atchison, Topeka and Santa Fe R. R., 221 South Bway, Los Angeles, Ch. Engr. Coast Line Div.

California—Hurley Machine Co., West 22nd and South 54th Aves., Cicero, Ill., plans to build an electrical manufacturing plant, on the Pacific Coast, here. Site not yet purchased. Estimated cost $1,000,000.

Ill., Chicago—Mundie & Jensen, Archts., 139 South La Salle St., are receiving bids for the construction of a 1 and 2 story 30 x 299 and 157 x 299 ft. storage and garage buildings, on Lawrence St. near Western St., for The Fair Department Store, State and Adams Sts. Estimated cost $230,000.

Mich., Detroit—Fisher Body Co., Genl. Motors Bldg., had plans prepared for the construction of a 6 story, 102 x 979 ft. factory addition for the manufacture of automobile bodies, on Fort St. A. Kahn, 1,000 Marquette Bldg., Archt.

Mich., Grand Rapids—Hayes-Iona Co., Inc., Muskegon St., N. W., plans to build a factory addition for the manufacture of auto bodies. Private plans. Engineer not announced.

N. J., Mt. Holly—Folsom & Stanton, Archts., 10 South 18th St., Phila., are receiving bids for the construction of a 1 story, 40 x 100 ft. garage, here, for W. D. Marren, Mt. Holly. Estimated cost $40,000.

N. J., Perth Amboy—Standard Underground Cable Co., 50 Church St., New York City, is receiving bids for the construction of a 3 story, 50 x 150 ft. factory on Washington St., here. H. J. Lewis, 336 4th Ave., Pittsburgh, Pa., Engr.

N. Y., Brooklyn—Studebaker Co. of Amer., 1700 Bway, New York, has awarded the contract for the construction of a 3 story, 190 x 220 ft. service building, on Dean St., here. Estimated cost $275,000.

N. Y., Buffalo—H. N. Kraft, (representing owner) 26 Summit Ave., plans to build an 8 story garage, on Main and Elmwood Sts. Owner's name withheld. Architect not announced.

N. Y., New York—O. Sinauer, c/o N. Langer, Engr and Archt., 81 East 125th St., will build a 1 story garage, at 234 West 154th St., by day labor. Estimated cost $50,000.

N. Y., Rochester—Brockway Motor Truck Co., Cortland, is receiving bids for the construction of a 49 x 176 ft. service station, 18 ft. high, on South Ave., here. Estimated cost $20,000. Architect not announced.

O., Canton—Pearl Motor Car Co., plans to build a 2 story garage, and will have 18,000 sq.ft. of floor space exclusively for sales, at 6th and Market Sts. Estimated cost $175,000.

O., Cleveland—Ferro Machine and Fdry. Co., 3166 East 66th St., has awarded the contract for the construction of a 1 story, 66 x 160 ft. warehouse and machine shop. Estimated cost $50,000. Private plans.

O., Cleveland—The York Ohio Ice Machine Co., 1106 Woodland Ave., has awarded the contract for the construction of a 2 story, 100 x 132 ft. factory, office and warehouse, at West 28th St. and Washington Ave. Estimated cost $60,000. E. McGeorge, 1900 Euclid Ave., Archt.

Pa., Charleroi—G. Woodward, plans to build a 3 story, 88 x 100 ft. service and repair shop. Estimated cost $45,000. Private plans.

Pa., Phila.—Fidelity Machine Co., 4015 Paul St., has awarded the contract for the construction of a 1 story, 86 x 160 ft. and a 2 story, 40 x 86 ft. machine shop, at Pike St. and Frankford Ave. Private plans.

Pa., Phila.—Osman & Holman, 121 West Wyoming St., are receiving bids for the construction of a 2 story, 89 x 125 ft. garage, on Green St. and Queen Lane. Estimated cost $60,000. Private plans.

Pa., Phila.—Supplee-Wills-Jones Co., 26th and Jefferson Sts., has awarded the contract for a 2 story, 80 x 90 ft. garage and service building, at 1520 North Stillman St. Estimated cost $55,000. Private plans.

Pa., Pittsburgh—J. D. McIlroy & Sons, 508 2nd Ave., is having plans prepared for the construction of a 1 story factory for the manufacture of sheet metal products. Estimated cost $40,000. Private plans.

R. I., Providence—Power & Mayer Mfg. Co., 150 Chestnut St., are having plans prepared for the construction of a 2 story, 90 x 90 ft. factory addition, for the manufacture of jewelry, on Chestnut and Elm Sts. Estimated cost $50,000. Perry & Whipple, Rhode Island Hospital Trust Bldg., Engrs. and Archts.

W. Va., Parkersburg—Seward Wire Co., 17 West 42d St., New York, has awarded the contract for the construction of a 1 story, 60 x 80 x 200 ft. manufacturing plant, here. Estimated cost $200,000.

W. Va., Sisterville—Grant Automatic Flowing Valve Co. plans to build a 1 story, 80 x 100 ft. manufacturing plant. Estimated cost $40,000. F. J. McCoy, Secy. Architect not selected.

Wis., Appleton—Scolding Lock Hair Pin Co., 844 College Ave., has awarded the contract for the construction of a 1 story, 40 x 200 ft. factory. Estimated cost $50,000.

Wis., Madison—Madison Gas & Electric Co., 120 East Main St., has awarded the contract for the construction of a 1 story, 50 x 75 ft. garage on Blount St. Estimated cost $40,000.

Wis., Madison—J. Peterson, 102 South Orchard St., has awarded the contract for the construction of a 1 story, 114 x 117 ft. garage, on Monroe St. Estimated cost $50,000.

Wis., Milwaukee—M. Tullgren & Sons, Archts., 425 East Water St., will soon award the contract for the construction of a 5 story, 100 x 150 ft. garage, for the Sixth St. Garage Co., c/o Architects. Estimated cost $200,000.

Wis., Pittsville—P. A. Hagen, Marshfield, plans to build a 1 and 2 story, 75 x 80 ft. garage. Estimated cost $50,000. Architect not selected.

Wis., Wausau—D. J. Murray Mfg. Co., has awarded the contract for the construction of a 1 story, 60 x 228 ft. machine shop addition. Noted May 18.

Ont., Galt—A. D. Porter Mfg. Co., Hobson St., plans to build a specialties plant for the manufacture of pressed steel and brass products for the plumbing, hardware, shoe and furniture trades.

General Manufacturing

Cal., Alameda—H. Hirschbeck, 2143 Alameda Ave., has awarded the contract for the construction of a 1 story dyeing and cleaning plant, at 2309 Encinal Ave. Estimated cost $5,850.

Pa., Phila—Barrie & Sons, 1312 Walnut St., has awarded the contract for the construction of a 3 story, 22 x 106 ft. printing building. Estimated cost $80,000. Private plans.

Va., Suffolk—Parker Buggy Co. plans to rebuild its plant which was recently destroyed by fire. Loss $150,000. D. E. Parker, Pres.

Wis., Cudahy—Bd. of Vocational Educ. plans to build a 2 story vocational school. Estimated cost $75,000 to $100,000. J. P. Beuscher, Secy. Rosman & Wierdsma, 424 Jefferson St., Milwaukee, Archts.

Wis., Milwaukee—H. E. Krueger, 1014 Holton St., has awarded the contract for the construction of a 2 story, 30 x 50 ft. bakery on Holton St.

Wis., New London—Hamilton & Sons Cannery Co., has awarded the contract for the construction of a 2 story, 50 x 75 ft. cannery factory. Estimated cost $45,000.

Ont., Bowmanville—Thomson Knitting Co. has awarded the contract for the construction of a 2 story, 50 x 150 ft. knitting mill. Estimated cost $100,000. A. Wilson, Mgr.

Ont., Ottawa—F. H. Plant, Ltd., 107 Murray St., has awarded the contract for the construction of a factory for the manufacture of wagons.

Ont., Owen Sound—Bd. of Educ. plans to build a technical school, including manual training department, physics and chemistry laboratories, etc. Estimated cost $200,000. F. H. Rutherford, Secy.

Ont., Toronto—Coca-Cola Co., 65 Bellwoods Ave., plans to build a 2 story, 100 x 260 ft. coca-cola plant. Estimated cost $200,000. G. A. Porter, Mgr.

Ont., Toronto—J. Kronick, c/o L. Coldoff, 313 Grace St., has awarded the contract for the construction of a 3 story, 50 x 118 ft. steam laundry on Bloor and Grace Sts. Estimated cost $25,000.